The Builder.

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FOUNTAINS were the order of the day at Sydenham, on Wednesday last, when our gracious Queen was present, to inaugurate the "great waters," in the lower grounds; and fragrant flowers, and fine weather, and flocks of fair ladies, all aided in making the day agreeable, and the sight a gay one. It is necessarily somewhat difficult to describe within reasonable limits the arrangements for a system of water-works, of such magnitude and variety as those at the Crystal Palace: we must endeavour, however, with the aid of our engraving on the next page, which shows the position of all the fountains, to give a correct general idea of the plan on which they are constructed and worked; leaving the pleasanter features of the *fête* to other pens.

The supply of water for ordinary purposes, and for provision against fire, within the Crystal Palace and through the grounds, is comprised in these waterworks. But their principal object is of course the formation of the great system of fountains. Within the Crystal Palace itself are various ornamental fountains, though necessarily of lesser magnitude, as for example the bronze fountains in the basin at the junction of the nave and north transept, of which we gave a representation some time ago, and the crystal fountain, that formed so prominent a feature in the Exhibition of 1851. The others are distributed through the architectural courts.

It will be seen on the plan, that in the ornamental basins on the terrace and below it, there are two distinct series of fountains, the upper series comprising the nine basins adjacent to the main building, and terminating with the large circular basin on the central walk through the gardens; the second series including the first series, and in addition to them the more extensive fountains in the temples, cascades, and two large basins in the lower grounds, which terminate the water supply. The upper series, or ordinary display now daily exhibited, can be worked independently of the others, but when the lower fountains are shown, the whole display is brought into action, and to effect this, it will be seen very elaborate arrangements have been found necessary. In order that these may be understood, let us first describe the arrangement in connection with the fountains of the tanks and upper reservoir, containing the supply of water for the jets, and of the lower reservoirs, where it is collected after being displayed.

The water for supplying the fountains is maintained at three different elevations;—first, in the two high tower-tanks which supply the 250-feet jets in the centres of the lower great basins, and concerning which towers we will speak more at length presently; secondly, in two lower tanks, which contain water for fountains, and for ordinary use in the building, and are situated near its northern extremity. These tanks supply also the high central jets in the upper series, as well as four secondary jets, round each 250 feet jet in the lower grand basins. The supply at the third elevation is contained in the large upper reservoir at the northern end of the building. This reservoir contains about six and a half millions of gallons, and from it the great body of the water displayed in the fountains is drawn.

To raise water from the upper reservoir into the high and low tanks above described, two 30 horse-power pumping-engines are placed near it.

For collecting the water after its display in the fountains there are two reservoirs, namely, one for the upper and one for the second series of fountains. That for the upper series (usually called the intermediate reservoir), is situated at some distance to the north of the central circular basin, and a little below it in elevation. This collects the waste water from the ordinary display of the upper fountains, which is first received into the circular basin, and flows thence into this reservoir.

Four forty-horse-power engines are placed adjoining the intermediate reservoir, which raise or return the waste water from it to the upper reservoir, so as to render it again available for display.

The receiving reservoir for the second series of fountains (which is called the lower reservoir), is situated below the south grand basin, and is of still larger capacity than the upper reservoir, as it would be required to receive all the water contained in the latter and in the high and low tanks, in the event of its being all displayed. The lower reservoir is constructed in the form of an ornamental lake, and the well-known representations of the various extinct animals, and strata illustrative of the science of geology, are placed on its eastern banks. The lower reservoir collects the waste water from the entire system of fountains when in full operation,—the waste being first received into the grand basins, and flowing thence into this reservoir; while to raise or return this waste water from the lower to the upper reservoir, so as to be again available for display, two forty-horse power engines are provided. The water, it will be seen, is thus made to play its part again and again.

An artesian well is sunk in the lower part of the grounds for a water supply, and a small engine is provided for raising the water from this to the lower reservoir. The well consists of a brick shaft 8½ feet in diameter, and 247 feet in depth, whence a boring is sunk to the additional depth of 328 feet; giving a total depth of 575 feet. The strata, we may mention, consist of clay and sand for 360 feet from the surface, and of chalk for the remainder. And now a few words as to the fountains themselves.

The water displayed in the upper terrace fountains is conveyed through pipes to the large circular basin, where it plays a second time in the low network jets round the margin, and in the other low jets through the basin. When the lower great fountains are displayed, all the waste water from the circular basin is similarly conveyed to them to play their jets of low elevation. Thus the water from the terrace fountains is displayed thrice, and that from the circular basin twice, throughout the entire operation.

We have given a view of what is not quite correctly called a water-temple, at the head of the cascade, marked G on the plan.* In this, the water issues from a ring round a ball, upon which stands the figure of Mercury, and from the cupids' mouths thence flowing over the steps of the dome, where it is collected in a cistern formed by the cornice: the bottom of this is perforated, and lets the water fall below in the form of a curtain to the openings. Water also flows from the lions' mouths at the projecting angles of the base. Bordering each side of each cascade is a range of tazze, borne by figures of children, and extending nearly to H, where the water falls into the basin below, past the face of an arcade, through which there is a passage-way. Next week we shall give a general view of the grounds, which will convey a clearer idea of the arrangement to those who have not visited the place.

* See p. 313.

The magnitude of this system of fountains may be conceived from the circumstance that, when the great waters are in full operation, there are 11,788 jets playing, and that the quantity of water displayed simultaneously in them is about 120,000 gallons per minute.

The whole of these works we must here mention were designed by Sir Joseph Paxton; and six contractors were employed under him in their execution, viz.—Messrs. Cochrane and Co.; Simpson and Co.; Easton and Amos; Aird; Cox and Wilson; and Roe. The engineering operations were executed under the superintendence of Mr. Shields, the company's resident engineer, and all the architectural portions were designed and superintended by Mr. Stokes.

The water-towers, which now form most prominent features in any view of the Crystal Palace, play an important part in the arrangement, serving various purposes. By their means, in the first place, a supply of water can be raised to such an elevation as to play jets of the enormous height of 250 feet in the large ornamental basins in the lower part of the grounds already referred to. The supply of water thus elevated is contained in a tank placed on the top of the towers, and is also available for extinguishing fires in the main building itself. Pipes communicating with the water-tanks are carried through the building with a number of fire hydrants placed upon them, so that in the event of fire every part of the edifice may be reached by streams of water of immense force. In the more elevated parts of the structure, which the ordinary supplies of water will not reach, this advantage would be peculiarly appreciated. We have already given some particulars of these towers;* but they are such large and costly works that we may be excused for adding the results of more minute inquiries.

A chimney shaft is carried up through the centre of the towers for the heating apparatus employed in the main building, and for the fires of the steam engines, which supply water to the building, and raise it to the top of the towers themselves. Besides serving these purposes, the towers, although somewhat heavy in appearance themselves, improve the architectural effect of the entire design of the Crystal Palace—a point of importance in a building of this character.

The towers are very solidly constructed. They are based, as we have already said, on a bed of cement concrete, and a foundation of brickwork in cement of immense strength is built on the concrete to support the external iron columns which mainly form the structure and carry the water-tank on its top. These columns stand in pairs, 3 feet apart, on the brickwork, each pair being united through their whole length by a solid iron plate or web in the 3-feet space between them. Each pair of

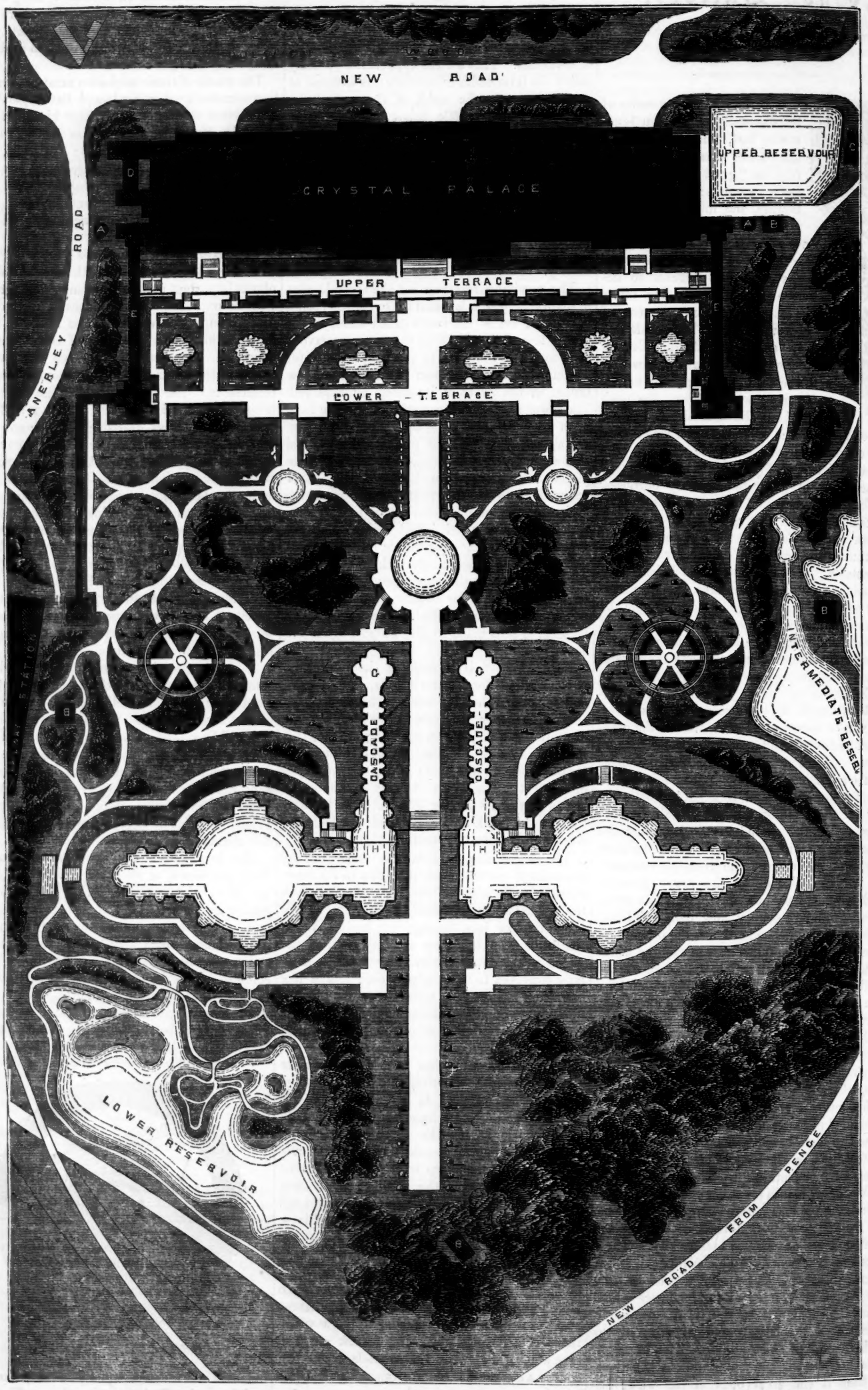
Half Section, showing Diaphragm, &c.

Half Section, showing Floor.

columns and web aids equally to carry the load, and forms, in effect, a single column. There are

* See p. 293, *ante*.

CRYSTAL PALACE, SYDENHAM: PLAN OF THE GROUNDS AND WATERWORKS.



AA. Water-towers. BBB. Engine-houses. C. Water-tank. D. Kitchens and Refreshment. EE. Wings. F. Railway Colonnade. GG. Water. HH. Arcade.

twelve of these compound columns, each finished with a broad bearing plate across the top and bottom, the bottom bearing plate resting on the brick foundation, and the top plate receiving and supporting the underside of the tank. These towers are polygonal in plan. Each compound column presents externally a flat surface; and between them is a second flat surface about double the width of the first. The towers thus present twenty-four faces, which, measuring from the centres of columns, are alternately 4 and 8 feet wide. The diameter of each tower is 47 feet. The annexed horizontal section will serve to explain further their construction.

Vertically, the compound columns are fixed in lengths of 3 and 17 feet alternately, the top length immediately under the tank being 3 feet. Between each compound column is a clear space 7 feet wide. These spaces are occupied partly by iron girders and partly by glazing. The iron girders are fixed between the 3-feet lengths of the columns, and thus form a solid ring of iron 3 feet deep round the towers at each of these intervals. The glazing occupies the spaces between the 17-feet lengths of columns, and there are also strong diagonal tie-rods between the compound columns fixed in these spaces of 7 by 17 feet.

The girders and tie-rods last mentioned thus unite the external surfaces of the towers, rendering them, as it were, a sort of tube. But internal supports are also requisite to stiffen the external surface in the same manner as the floors of a house stiffen the walls. This is effected by fixing internally, at each 20 feet in height, a horizontal diaphragm or ring of plate iron. These rings are 5 feet wide, being 36 feet internal and 46 feet external diameter. Their outside edges are attached to the columns, and their inside edges are strengthened by angle iron, and drawn tight by horizontal tie-rods. The brick chimney-shaft is built in the centre of the rings last referred to, and of the tower. It is 9½ feet external diameter, and a winding staircase round it gives access to the top. A floor and landing of timber are also fixed at every 20 feet in height across the space between the chimney-shaft and external columns. The timber floor is placed at the top, and the iron diaphragm or ring at the bottom, of each 3 feet length of the columns.

The arrangements for the water supply will now be easily understood. Six water columns are erected within each tower round the shaft, rising through the open spaces between the shaft and the iron diaphragms, as well as through the floors. Five of these are connected directly to the bottom of the tank, and they serve to convey the water either upwards from the pumping engines to the tank, or downwards from the tank to the high fountain pipe, or to the pipe which passes through the main building. The sixth water column acts as an overflow pipe to the tank.

The five water columns which convey the supply are connected by outlets at their bases to a horizontal pipe laid round the basement floor of the towers. This pipe is connected at one end with the pumping engines, and at the other with the pipes to the high fountain and the building. The communication of the water supply in either direction is effected by an arrangement of sluice-cocks on the pipes. All the six water columns are erected in 3 feet and 17 feet lengths, corresponding to those of the outside columns, and are connected to each other by girders and tie-rods at each 3-feet length.

These columns, however, carry no portion of the weight of the tanks, as their expansion and contraction from changes of temperature would (from their containing water and being protected from the weather) be so different from that of the outside columns, as to render a similar employment for them inadmissible. The tanks are therefore entirely supported on the external columns. They are circular in plan, having their bearing round the outside circumference. Their bottoms are dome-shaped. They are 47 feet in diameter, and 38 feet in extreme depth, and are capable of containing about 300,000 gallons, or nearly 1,400 tons of water each!

The chimney-shafts are conveyed through openings in the form of a tube, made for them in the tanks. A gallery supported on brackets is carried round the base of each tank, and from this magnificent views of the neighbouring country are obtained. The structure is finished by an ornamental roof, which covers the gallery and the tank. The extreme height of these towers from the ground is 282 feet. The top gallery, which is the highest point of the Crystal Palace buildings made attainable to the public, is at an elevation of 550 feet above the level of high water in the Thames. We have only to add to this description, that there were employed in the construction of these towers about 2,000 tons of iron, besides various other materials, and that in the whole about *thirteen miles* of pipes have been laid, ranging from 36 inches in diameter downwards; a large proportion, perhaps one-half, being above 20 inches.

On Wednesday, when the whole of the waters burst forth simultaneously for the first time, and the sun shone, and the Queen came, and the people cheered, the effect was admirable: it was a scene that will not soon be forgotten by those who were there to see. Schlegel says truly,—"The soul needs a certain amount of intellectual enjoyment, to give it strength adequate for the daily struggle in which it is involved;" and we know of no place where this may be more completely obtained than at the Crystal Palace at Sydenham.

ON THE BRIDGES AND VIADUCTS OF THE PRESENT DAY.*

THE CRUMLIN VIADUCT, &c.

My own professional engagement in the locality enables me to enter more at length into the description of the Crumlin Viaduct, situated on the Newport, Abergavenny, and Hereford Railway Extension, which, with the exception of the Aqueduct of Spoleto and the Portage Timber Viaduct, in the United States, exceeds any other structure of the kind in height. It is a remarkable example of the modern application of iron to such purposes. The dimensions are as follow:—Total height from the bed of the river to the level of the rails, 200 feet; the piers from centre to centre, 150 feet; actual bearing of girder, 148 feet; the total length of viaduct, 600 yards. There are altogether ten spans or openings, but they are unequally divided by a tongue of land on which are placed masonry and earthwork, about 50 yards in length, making in reality, as far as the ironwork is concerned, two separate viaducts. The larger viaduct has seven spans and six piers; the smaller one, three spans and two piers. Excepting the height of the piers from the level of the valley, the two are precisely similar, and it will be necessary only to allude to the larger one. The piers are formed of clusters of cast-iron columns, placed in stages. Each column is 17 feet long by 1 foot in diameter, cast hollow, the thickness of metal, varying from 1 inch to ⅞, diminished within, the same external diameter and form of column being preserved throughout. The number of columns in each stage is fourteen, and they are arranged on plan, in the longer direction, in four rows of three each, with one standing singly at each end of the piers, which gives it a salient angular outline. The width between the columns at the base of the pier measures 13 feet 6 inches in every direction, taken on the square, excepting between the centre rows, where it measures 6 feet throughout the height. The pier gradually diminishes to the top of the columns below the girders, where the dimension 13 feet 6 inches is reduced to 9 feet, and at the external angle columns to 2 feet. The dimensions of the piers at the base are between the centres of the columns 60 feet by 27 feet, and the upper dimension is 30 feet by 18 feet, giving a diminution of 30 feet in one direction, and of 9 feet in the other. To effect this, nearly all the columns are more or less inclined, and the two centre are the only upright ones. The four columns at the corners, forming the square of the piers, lean diagonally, 4 feet 6 inches. The six intermediate columns correspond, but lean each in one direction only. The two single outside columns are most inclined, being 11 feet 6 inches out of the perpendicular, forming a raking brace. The top of each stage of columns is connected by horizontal cast girders, 1 foot deep, with 5-inch flanges, bolted together. There are also horizontal and vertical wrought tie rods. The former are circular, and 2 inches diameter, and the latter flat bars, 4 by ¾. They are tightened with wedges where necessary. The columns are fitted together with socket joints, a projection of half an inch being left on the top of the cap, which fits into the base of the column above. These are held together by four ears cast on the top and bottom, which are fixed with bolts and nuts. The joints of the columns are planed and fitted together with the greatest nicety to ensure a perfect bearing. The base plates upon which the columns stand vary from 3 feet to 5 feet in height, and have a plate 3 feet square resting on the masonry, into which they are joggled, plugged, bolted, and put together with sulphur joints. The number of stages of columns to centre piers, it will be perceived, are ten, without base plates. The upper stages of the columns are connected together at top by stronger horizontal girders than those below. They are finished with A-shaped, or triangular trusses, placed over each row of columns below, upon which the girders rest. It should be mentioned that the foundations for the piers are formed of solid, flat bedded, and jointed masonry: they were generally carried down to the solid rock, and vary from 10 to 3 feet in depth. The largest blocks are placed immediately under the base of the columns, and so arranged as to distribute the weight below as much as possible. The girders are formed of wrought-iron, after Warren's patent. This consists of a stout beam above, and a bottom tie below, with diagonal filling in, the whole being supported by the top beam on the principle of an inverted truss: the mode of execution, however, differs much. The girders at the Crumlin are 150 feet long, and 14 feet 6 inches deep, outside dimensions. The dimension of the top tubular beam is 14½ inches by 9 inches; the average thickness of the plates being, the sides an inch, the top and bottom half an inch. The sides have flanges formed on the edges, which are rivetted to the top and bottom plate. Extra stiffening pieces are carried along the bottom, and likewise the joints and where the bolts cross. The ties at the bottom of the diagonals of the girder are formed of a series of four wrought bars, 6 inches by ⅝-inch average, placed in pairs 3 inches apart in the centre, to admit the diagonals and packing, and showing a 4-inch separation on face; the whole forming a square combination measuring 16 inches by 7 inches: these bars reach from diagonal to diagonal, where they are all four joined with a plate 16 inches deep, and bolted with five ⅞-inch rivets to each. There are eighteen diagonals to each girder, which act as struts and ties until they gradually approach the centre, where they act as both. The diagonals do not cross each other, as is the case in the lattice girder, but are both fixed to the top beam and bottom tie with large bolts 3½ inches diameter; and it is on the care and security with which these parts are connected that the chief strength of the girders depends. The diagonal ties and struts present a different section, the main strut being of a cross shape, measuring 10 inches to each extremity, cut out of ⅞-inch plates, with four 5-inch L angle pieces rivetted. The ties are formed of two flat iron bars 9 inches by ½-inch, which lap the struts, where they are rivetted, top and bottom. The ties near the centre, extending two on each side, are strengthened by smaller pieces of T iron, to enable them to act in some measure in

* See page 328, *ante*.

the double capacity of ties and struts. The part of the lower beam or ties between the four centre strains of diagonals is strengthened by an additional bar 4 inches wide, filling the space between the other bars, and rivetted like them to the junction plates. The whole girder is gradually strengthened by an additional thickness of plates towards the centre, given by a close calculation of the forces required to be resisted. The side plates of the girder and ties diminish from 1 inch in the centre to $\frac{5}{8}$-inch at the ends. Each pair of girders is connected at each of the large bolts or pins with a 5-inch cast-iron hollow bar, with $\frac{1}{2}$-inch thickness of metal. The bolts are passed through the ties, diagonals, and packing pieces, leaving the heads outside, the ends of the pin projecting about an inch: the end is then covered with a cast-iron cap, which is screwed or bolted with a $1\frac{1}{2}$-inch screw into the centre of the pin, to prevent the same from drawing out. This affords a means of connection with the cast-iron bars by corresponding flanges, which are firmly bolted together. The bearing of the girder, by which the whole is sustained, is worthy of particular notice. It is held by the ends of the *upper beam only*, the lower one dropping in a state of suspension: the weight thus entirely rests on the last pin, which passes through the outside diagonal tie. The top of the angular termination of the piers is furnished with a casting 3 feet 6 long and 5 inches wide, on the upper surface of which is a flat sinking $\frac{3}{4}$-inch deep. Under the ends of the upper beam are placed cast-iron blocks, hollowed out on the upper surface to receive half the diameter of the pin, and of sufficient depth to raise the bottom flanges of the beam clear of the sliding groove. This block has perfect freedom of play backwards and forwards, to suit the expansion and contraction of the girders, as affected by the temperature of the atmosphere, or the superincumbent weight: for this purpose a space of 9 inches is likewise left clear between the ends of the beams. The ordinary expansion and contraction in summer, between midday and midnight, does not exceed $\frac{1}{4}$ of an inch. The girders have been tested with a weight of 250 tons each, which produced a very slight deflection; and were the viaduct loaded with locomotives, this would be seven or eight times as much as could be put upon them. The struts have also been tested with a crushing weight of 250 tons. The roadway is formed of 6-inch planking, bolted to the beams, and it is intended that the rails should be laid on strong longitudinal framed sleepers. An ornamental cast-iron balustrade is fixed on each side of the roadway. The whole viaduct is not straight on the plan, the approaches to the larger one being curved, to which the last spans of the viaduct accommodate themselves by a slight inclination southwards at the extremities. This viaduct has been described as one of the engineering wonders of the day; and it may be mentioned that another, projected by the same engineers, is of much greater height. Messrs. Liddell and Gordon, engineers; Mr. M. W. Carr, resident engineer; Messrs. Kennard, contractors.

The Sitter Viaduct, on the St. Gall and Appenzel Railway, an account of the completion of which has just appeared,* is one of similar construction, except that the girders are lattice. It is close upon the same height, and has four spans, the two centre being 138 feet, and the two side ones 130 feet; but, on the whole, is a work of less magnitude than the Crumlin.

The Newark Dyke Bridge, crosses in one span a branch of the Trent at an angle so oblique as to render it necessary that the girder should be 240 feet 6 inches long, whilst the width, measured on the square between the abutments, is only 97 feet 6 inches. This is also one of Warren's patent, but differs materially from the Crumlin, inasmuch as the top tube and the parts compressed are of cast iron. Each line is carried by a pair of girders 13 feet apart, between which the trains run. The top tube or strut is composed of twenty-nine cast-iron pipes, 13 inches diameter, the thickness of metal $1\frac{1}{2}$ inch. The ends of these are turned and nicely fitted together and bolted: the cast iron struts are of the form of a Maltese cross. Each girder weighs 122 tons 10 cwt.; the whole bridge, including the platform, 589 tons. The deflection caused by two heavy goods engines, travelling both fast and slow (60 tons weight), was $2\frac{1}{8}$ inches. This bridge was erected before the Crumlin, and although the span is greater, the preference must be given to the latter, as being composed entirely of wrought iron.

Chepstow Bridge, over the River Wye, by Mr. Brunel, is a remarkable example of the combination of the tube and girder, to which may be added a third principle, that of suspension. The whole length of the bridge is 623 feet, one-half of which is crossed by a viaduct girder of three spans, the remaining portion by a single span of 296 feet. The central pier is composed of six cast-iron cylinders 8 feet diameter below, and placed in two rows of three each: the viaduct piers are in single rows of three in each. Two girders, of uniform depth throughout, carry each line of rails: those above the roadway are perfectly distinct, and do not depend upon each other. 50 feet above the large span a circular tube 9 feet diameter is placed, from which the roadway to each is suspended. This is done by two vertical frames of wrought iron, dividing the girder into three spaces, the centre the widest, the spaces braced with cross chains put together in links similar to suspension bars. The main chains hang from the tube at the ends over the pier to the opposite corner at the level of the roadway, where they are joined across the centre on both sides of the girder, and the middle space is crossed by chains both ways, which gives additional security to the centre of the girder. The tubes are carried at each end on seventeen rollers, 5 inches diameter, which allow for expansion and contraction: the diameter of the pins which carry the leading chains is 7 inches. The girders are formed of single wrought plates, with top angular casing 3 feet wide, and a curved bottom flange. This girder is made strong enough for the 100 feet spans; and over the space three times that width, it will be perceived that it is supported in two intermediate parts, so that in reality the girder has very nearly the same bearing throughout. This is an extremely ingenious arrangement, the sectional quantity of material used with reference to the span being less than in any like structure. But it is to be regretted that from its want of symmetry and its lop-sided appearance, it is by no means an agreeable design. The Great Saltash Bridge is on the same principle, with four spans, the two principal not less than 445 feet.

The objection to combination girders does not apply to those made all of wrought iron. In cast iron the girder is broken by the first deflection, but no mischief is done to wrought before the trussing-bars or suspension-rods are called into action.

The Boyne Bridge, on the Dublin and Belfast Railway, is one of the finest examples of the lattice girder which has hitherto been executed. The main span is 264 feet between the bearings: the two side spans 137 feet. At the end next the town of Drogheda are thirteen arches of masonry of semicircular form, 61 feet span. At the other end are three similar ones. These are built of finely-wrought stone. The height of the bridge above water-mark is 100 feet, allowing the passage of shipping without striking top-gallant masts. The depth of the lattice girder is $22\frac{1}{2}$ feet. It is formed of top and bottom wrought tubular chords: the area of the top chord where the greatest strength is required, is 265 inches, where the least 137: the lattices are placed on each side of the chord at an angle of 45 degrees, 7 feet 6 apart, forming double squares in height: the sizes vary from 10 inches by $\frac{5}{8}$ to 4 inches by $\frac{1}{2}$, according to the strains: they are closely bolted to cross braces at the intersections. There is a double line of railway, with the girders on the outside, measuring 24 feet 6 inches on the clear: the roadway is supported on cross beams, also on the lattice principle, 7 feet 6 inches apart, covered with 6-inch planking bolted down. The girders being joined over the piers form one length, and are fixed only on one pier; the other supports being the usual rollers working in grooves to admit of expansion. Sir J. M'Neil was chief engineer. Mr. Burdon and Mr. Barton (to the latter of whom I am indebted for much information on the subject) were the resident engineers.

It will be perceived that the principle of the lattice girder does not materially differ from that of the large tube, the sides of the former being open with lattices where material is not so much required. With the same weight of metal the lattice girders will carry a greater load than tubes. The comparative duration has not yet been ascertained, but the lightness and elegance of appearance, and several other considerations, are greatly in favour of the lattice bridge. For further particulars useful reference may be made to notes of the comparative strength of the tube, warrens, and the lattice girder, by Mr. James Barton, C.E. Various opinions have been also given by eminent engineers, which will be found in the "Transactions of the Institution of Civil Engineers."

In forming a comparison of the materials to be used for any particular work, whether a bridge or a viaduct, many questions have to be taken into consideration, but none more important than that of economy. To arrive at that, the original outlay and the probable durability must be taken into consideration; and from what has hitherto taken place, the conclusion arrived at appears to be in favour of wrought-iron; but it should also be noticed that metals can be destroyed by repeated vibrations, which have a tendency to separate the particles of which they are composed. As a sufficient excess of strength should be provided, this objection does not detract from the value of the material, while it demands additional skill and ingenuity on the part of the constructor.*

* See p. 271, ante.

ARCHBISHOP WHITGIFT'S HOSPITAL, CROYDON.

AT the third annual meeting of the Surrey Archæological Society, held at Croydon on the 12th inst. a descriptive account of Whitgift's Hospital, by Mr. W. Pettit Griffith, was read. The following is the substance of it:—

Among the many interesting public buildings in the town of Croydon and its suburbs, this hospital ranks as the most important charitable institution, and offers an example of ancient domestic architecture, illustrating the hospitals, schools, and almshouses of the Middle Ages in England.

On the 29th of March, last year, the Court of Chancery sanctioned a scheme for the better management and regulation of this interesting and important charitable institution, and as alterations may from time to time be effected, it may be useful to place on record a more detailed account of the building than has hitherto been attempted.

Archbishop Whitgift, the founder, having obtained letters patent for building this hospital, with license of mortmain from Queen Elizabeth, dated the 22nd of November, 1595, in the thirty-eighth year of her reign, purchased the following lands for its site: the Checker, in Croydon, cost 200*l.*; a tenement adjoining, cost 30*l.*; and another tenement in Croydon, called Stay-cross, with one acre and a half, cost 80*l.* Upon the ground previously occupied as above, the hospital was constructed, and was therefore not rented.

The Rev. Samuel Finch, vicar of Croydon, in letters to the Archbishop of Canterbury and Mr. Woormall, of Lambeth, written in 1596 (which are preserved in the Lambeth MS. Library, No. 275, and printed *in extenso* in Ducarel and Steinman's Histories of Croydon), entered minutely into many particulars respecting the erection of the hospital.

The bricklayers' work was executed for 1s. 2d. to 1s. 4d. a day; and the labourers were paid 11d. a day. The sand was procured from Duppa's-hill, as it could not be obtained from the park. The foundations were formed with brick, chalk, and large flint; small flint being used for filling in. These materials were properly laid, not in a confused manner, but "orderlye," and "rammed stronglye, course upon course, stronge and sure." Four loads of flint cost 10s. which saved 1,000 bricks at 16s.

* This paper was read, as we mentioned last week, at the Institute of British Architects. The closing meeting for the session was held on the 16th: we defer our report.

The masons employed were Nicholas and Christopher Richardson, citizens and freemasons of London, and Gabriel Anscombe, of Charlton, yeoman, who were bound to Samuel Finch, John King, and William Tagbourne, in 100*l.* to execute the works. The bond bears date the 19th of February, A.D. 1596. In this agreement they are bound to procure so much good and seasoned freestone as shall be sufficient for the doors and windows belonging to the said intended hospital. The doors were to be wrought "fayre and comelie," and the windows with "bowgeworke." The whole to be completed at 9d. the foot for the windows, and 10d. the foot for the doorcases.

The foundations were begun on February 14th, 1596, and, as the workmen were digging them, several skeletons were discovered: these were, in all probability, says a writer, the remains of the Londoners, who, flying from the battle of Lewes, where they had taken part with the barons against Henry III. were intercepted at Croydon on the 14th of May, 1264, by a detachment of the king's forces, who put them to the sword with great slaughter.

On March the 22nd, 1596, the founder laid the two corner-stones, north and south. "The 27th of June the first of all the hospital was reared, and the 6th of September the last of the same was reared; and, the 24th of September all the outworke, as tyelinge, &c. was (God be praysed) fully finished, A.D. 1597."

"Trees were sett in the hospital outyard, Decr. 1599, and in March, 1603, thirty-two elmes and ashes were sett at the hospital."

The Rev. Samuel Finch, then vicar of Croydon, was the person employed by the archbishop to make contracts, to overlook the workmen, and to see them put his intended plan into execution. This he performed with very great care and diligence, paying them regularly every week: the total amount of which to September 29th, 1602, was the sum of 2,716*l.* 11s. 11d.

This hospital is endowed with lands for the maintenance of a warden, schoolmaster, and twenty-eight poor brethren and sisters, or a greater number, not to exceed forty, if the revenues should admit of it. The schoolmaster, who is likewise chaplain, is allowed by the statutes 20*l.* per annum, the warden 11*l.* and the other members 5*l.* each, besides wood, corn, and other provisions. The nomination of the brethren and sisters was vested by the founder in his successors in the see of Canterbury, whom he appointed also to be visitors. Whenever that see shall happen to be vacant, the rector of Lambeth and the vicar of Croydon are to fill up the places. The persons to be admitted must be sixty years of age at least; inhabitants of Croydon and Lambeth are to be preferred. Among the crimes to be punished by expulsion, are "obstinate heresye, sorcerye, any kind of charmmynge, or witcherafte."

The lands with which the hospital was endowed were of the annual value of 185*l.* 4s. The estates have been much improved, and the revenues of the hospital farther increased by various benefactions.

The hospital is square in form, and has a court in the centre converted by the poor brethren into flower-gardens; it is situated on the east side of the high street on the London side of the town. Over the doorway are the arms of the Archbishopric of Canterbury, surmounted by a mitre in bas-relief. In the frieze of the pediment is inscribed, "Qvi Dat Pavperi Non Indigebit." The buildings are in the old English style, constructed of red bricks, with black glazed bricks in the principal front, forming the initials of the founder, diagonal squares, &c. with the foundations of flint; the muntins jambs, &c. of windows, quoins of building, &c. are of stone, and have been disfigured with cement. The labels over the windows in the quadrangle are of moulded red bricks, worthy of notice. The principal front remains as in the print engraved in 1755 (published in "Queen Elizabeth's Progresses"), with the exception of the removal of the clock, which projected into the street, and the bell-turret over it on the roof.

With regard to the clock and bell, W. Drummond, esq. of Croydon, kindly permitted me to make the following extracts from a copy of an old memorandum-book formerly belonging to Dr. Rose:—

"Mr. John Shaw, clerk of the Chamber of London, gave the dial."

"The clock to this hospital was removed in 1810 for a double purpose, thro' a fear of the roof falling in where it then stood, and to remove the dial on the inside of the quadrangle, for the greater convenience of the poor."

When the bell was taken down the following inscriptions were found upon it:—

"Decani Dalyson Ecclesiæ beatæ oremus pro bono Statu Mariæ de Lincolne.

"Thomas Dalyson Miles firmarimus hujus Manerii de Gretwell me fieri fecit quarto Aprilis, Anno Dmi. 12 . ."

This bell is therefore about 600 years old: "the rest of the date is obliterated either by the continual striking of the clapper or the friction of the rope. It is now so placed that the inscription cannot be damaged."

The memorandum-book above mentioned also alludes to several gifts presented soon after the foundation of the hospital. John Parker, Neville dean of Canterbury, and Mr. Brackenburie, each gave a cup of silver. Mention is also made of houses at Northampton, bearing the date of 1595. Over the outer gate in an upper room called the Treasury, are deposited (in boxes which once were remarkably strong and secure) a variety of papers relating to the hospital; viz. purchase-deeds of the estates in the neighbourhood, leases, licenses, &c. The more curious and valuable are Queen Elizabeth's original grant to the founder, and the archbishop's deed of gift of the several estates with which he endowed this hospital. They are both on vellum; the first neatly endorsed, and the margins beautifully ornamented with a drawing of the Queen in her robes, sitting in a chair of state, and the royal arms in different compartments. The other instrument is written in a very fair legible hand in English: the beginning is embellished with a drawing of the archbishop in his robes; the margin contains the arms very highly illuminated. These drawings are engraved in the Appendix to Ducarel's History of Croydon, and other papers relating thereto.

The principal objects of interest connected with this building are the chapel, the hall, the kitchen, and the founder's room.

The chapel was dedicated by the name of "The Chapel or Oratory of the Holy Trinity," on the 10th of July, 1599, by the Bishops of London and Chichester. It is situated in the south-east angle of the quadrangle, and is very neat and curious. The eastern window is Perpendicular, in three lights, and contains, in painted glass, the arms of the archbishopric of Canterbury, impaling Whitgift; viz.—Argent, on a cross fleury sable five bezants. Over this window, externally, is the following, inscribed upon a stone tablet,—"Eboracensis hanc Fenestram Fieri Fecit, 1597." On the walls of the chapel are suspended many objects of interest; on the east wall is a framed tablet, containing seven commendatory verses, to the memory of the founder, and also a board containing a Latin inscription, describing the miseries of human life. On the north wall is a wooden tablet with a pediment, containing select Latin sentences, surmounted with "I. W." united by a knot, and dated 1600. Also a portrait of one of the founder's daughters who died in 1616, aged 38, dressed in the costume of Elizabeth's time; and an outline delineation of Death as a skeleton and grave-digger. Attached to the south side of the chapel is an ancient oak tablet with a pediment, containing the Commandments, supported by Moses and Aaron, in semicircular-headed panels. Affixed to the west wall is an excellent portrait of the founder, surmounted by his arms and motto, with Latin inscriptions. He is standing at a table, containing an open Bible, bell, watch, seal, inkstand, knife, pens, &c. all minutely painted.

On each side of the chapel are oaken stall-seats with carved finials, 2½ inches thick: these seats were finished on Feb. 5th, 1598, and arranged each side of the chapel from west to east, leaving a central passage.

The hall is the next object of interest: it is in the north-east angle of the building. The windows on the west side contain quarry lights, with fragments of stained and painted glass, with the founder's motto upon a coronet,—a shield with the royal motto, a mitre and cross, with the motto "Deum." On the east side the windows contain the arms of "Edwardus Aysworth, anno 1598," and stained glass inserted in 1851. The hall has a fire-place, containing the dogs for burning wood; also an ancient oak table, given "to the poore for ever," and very substantial benches. Upon the table is an interesting black-letter Bible of 1595, repaired at the expense of Thomas Lett, of Lambeth, in 1813, and again in 1851. An ancient chest, bound with iron, containing the plate, used to stand in the hall: it is now in the treasury over the outer gate.

Adjoining the hall is the kitchen, connected by a large Tudor arch: beneath the latter is a smaller arched communication. In this room is an oak seat, panelled and inscribed as "The gift of Edward Chapman, 1816:" it formerly stood in the outer gateway. There are also several curious recesses in the walls, another oak seat, and objects of interest.

Immediately over the hall is the founder's room. In this room is an oak table, now worm-eaten, at which the archbishop has often dined; and it is stated that Queen Elizabeth has also dined at this table. On the south side of the room is a curious and elaborately-carved oak Elizabethan chimney-piece, with the founder's arms in the centre. The walls of this apartment, and the room adjoining south (now the warden's), are lined with wainscoting, 7 feet 5 inches high: the doors are worth notice.

Lysons, in his "Environs of London," alludes to "three antique wooden goblets," belonging to the establishment: one of them, which holds about three pints, is inscribed with the following legend:—"What, sirrah! holde thy pease; thirste satisfied, cease."

There are at present nineteen brothers, eighteen sisters, and a warden and schoolmaster, and their dwellings are arranged on each side of the quadrangle, and are of good and convenient size.

In 1848 were erected, at the east end of the hospital grounds, houses for five additional members. The funds were raised without any burden on the existing members of the charity. All new members had their stipends fixed at 40*l.* a-year, instead of taking an equal share of the revenues; and the difference between the above allowance and the share was funded until a sufficient sum was raised.

The new applicants were, of course, happy to commence with 40*l.* a-year, and the stipends of the old members were unaltered. After the requisite sum was provided, all the inmates were restored to an equal participation of the revenues.

The following is a list of the chaplains, from the foundation of the hospital. Ambrose Brydges, A.D. 1600; John Ireland, 1601; Robert Davies, 1606; William Nicholson, 1616; John Webbe, 1629; Thomas Gray, 1651; Wm. Crowe, 1668; John Sheppard, 1675; John Cæsar, 1681; Henry Mills, 1711; Sam. Stewley, 1742; John Taylor Lamb, 1752; James Hodgson, 1774; John Rose, 1801; John Collinson Bissett, 1812; George Coles, 1843, the present chaplain.

Like most of our charities, this hospital has not been exempted from abuses; some of them are explained in a pamphlet printed in 1813, entitled "An Account of the Proceedings and Evidence on a Writ of Enquiry executed before the Sheriffs of Middlesex and a Jury, on the first day of November, 1813, to ascertain the Damages due from the Rev. John Rose, D.D. unto the Warden and Poor of the Hospital of the Holy Trinity in Croydon."

Prior to 1855 the management of this hospital was conducted by the brethren, who kept their own cash in a chest, and divided the revenues among themselves. They also determined the terms of their leases, and regulated all other matters in connexion with the charity; and although the original intention of the founder embraced a school for the rising generation, as well as an asylum for the declining, still the school (from its being considered to be simply a classical school, and therefore not desirable in modern times for poor children), had fallen into complete disuse. A deputation, consisting of the Vicar of Croydon, the churchwardens, and John William Sutherland (a magis-

trate), and several gentlemen and tradesmen of Croydon, waited on the Archbishop of Canterbury, on January 21st, 1853, and presented a memorial suggesting a mode by which the school might be restored and rendered subservient to the requirements of the present age. The Archbishop of Canterbury gave ready attention to the memorial, and the brethren of the hospital lent their aid, and on March 29th, 1855, a new scheme for the management and regulation of the Hospital, received the sanction of the Court of Chancery.

Under this scheme, all brethren hereafter appointed are to receive stipends not exceeding 40*l.* nor less than 30*l.*; and all sisters hereafter elected are to receive such stipend, not exceeding 30*l.* nor less than 25*l.* The surplus revenues which will accrue, together with all future increase of rents, are to be applied towards the establishment of two schools (in connection with, and as part of the foundation). One is to be a "Commercial or Middle School," suited to the educational requirements of the sons of tradesmen, professional men, and gentlemen of humble means; and the other school is to be for the sons of the working classes, after the plan of national schools. And it is considered that, from the increasing value of the Hospital estates, and the short time in which many deaths of members take place, on account of the advanced age (60 years) at which they are admitted, it will not be many years before this new scheme will produce a most satisfactory result, viz.: the restoration or addition to the present asylum, of valuable and eminently useful scholastic establishments, affording opportunities to boys of acquiring a sound, religious, moral, and useful education, which verifies the saying of Boyse Sisi, ambassador from France at the time of the Archbishop's death, that—"The bishop had published many learned books, but a free school to train up youth, and an hospital to lodge and maintain aged and poor people, were the best evidence of Christian learning that a bishop could leave to posterity."

THE ARCHITECTURAL ASSOCIATION.

SEVERAL discussions have taken place lately on the position of the Architectural Association, and the steps which should be adopted. At a meeting on the 2nd of May, Mr. Rickman moved a string of resolutions, the fourth of which went to declare that the Association had been virtually renounced by both the elder and the younger members of the profession, and that there were "sufficient reasons for at once taking the requisite measures for dissolving the society." The meeting, however, gave evidence that there was still vitality in the Association, and by show of hands negatived the proposition. On the 30th of the same month, Mr. Arthur Allom read a Paper on "The Past, Present, and Future Condition of the Young Architect;" in the course of which he traced the progress of the Association, showed what it had done, and combatted the opinion of those who consider there is no necessity for two architectural societies in London. The reader protested against the apparent jealousy of the society in some quarters, and at the same time deprecated the strong expressions made use of occasionally in the rooms of the Association with reference to the Institute of Architects. The reader further said, he should like to see the various societies for the study and development of architectural art amalgamated into one grand Institution,—not absorbed into the Institute, but holding their meetings in one building. A long discussion ensued, and, at the close, the chairman (Mr. Charles Gray) stated, that he proposed to bring forward at the next meeting a series of resolutions relative to the management of the Association.

In the course of the evening, reference was made to the report in these pages of the discussion some time ago, at the Institute, as to the diploma question and the Association, and it was suggested that the *Builder* had displayed an *animus* against the Association. Can it be necessary for us to deny such an assertion? an assertion which could only have proceeded from forgetfulness, want of knowledge, or desire to misrepresent. From the first hour of its establishment, the Architectural Association has had our sincere support, and we have ever borne most willing testimony to the good which has proceeded from it. At the present moment, in anything that can serve it, it may command our aid. As to the mendacious and scurrilous pen which has elsewhere perverted the truth in connection with the Association, to serve its own purposes, as it has often done before, we leave it, for the present, to the contempt which it cannot fail to engender in the mind of every honest man who will take the trouble to look to the facts.*

The Council of the Institute, anxious, probably, to show their sympathy with the objects of the Association, and their desire that, should the Association be dissolved, as was at one time contemplated, the impression of antagonism should be removed, either have addressed, or are about to address, a letter to its committee, suggesting amalgamation, and pledging themselves, we believe, to aid in arranging all such opportunities for artistic or literary exercises as may be desired. We offer no opinion on the proposition: it will be for the members of the Association to consider it, and decide for themselves. They may believe, however, that it was drawn up in the best spirit, and in that same spirit they will, doubtless, receive and discuss it.

CONTRACTORS IN GROSS.

WITH reference to the article, headed a "Treatise on Building, by Contract," in your paper of the 31st of May, in my mind it requires no logic to clearly prove, both in an economic point of view, as well as in a mercantile and artistic, the many advantages to all parties, in the original mode of giving away contracts, when compared with the present monopolising and demoralizing system which, if continued, will ultimately degenerate the different trades in the building and other lines. It is a fact beyond contradiction, that of all the public and other buildings of the past ages, which we view as landmarks of architectural beauty, each trade had the control and benefit arising therefrom, in their own department, which benefit now goes into the pocket of the monopolising contractor, who cannot possibly be as good a judge as each separate tradesman; nor is the work done so well or cheaply, as when we had our Bernasconys, Browns, and Palmers, of London, in their line; and the different master masons, stone-cutters, slaters, carpenters, stucco workers, painters, and plumbing employers, who by this corrupt system are all but extinct, as they had either to retire from business, die in despair, or become inmates of the poorhouse, and that from the way their separate trades were encroached on by the present corrupt system. This mode offers no object of emulation, nor any hope or opportunity for the sons of each tradesman in his particular line to learn his business, as was formerly the case under the old system, when Westminster Abbey was erected, St. Paul's, Greenwich Hospital, Henry the Seventh's Chapel, Lord Grosvenor's, and numberless other edifices in England, as well as the Bank of Ireland, Four Courts Temple, Old Man's Hospital, Custom-house, Lord Kingston's, Earl Belmore's, Lord Gosford's castle, and many others that do honour to the architects that designed them, and to the different tradesmen and artists who executed the different works in their own department. The present mode is the cause of the emigration of all those men of talent and emulation, transplanting them to other lands, and rising in visible judgment against our empire, both in art, trade, and commerce, formerly admitted to be the mistress of the world for talent, emulation, and enterprise; and it astonishes me much that the Government of the day is persistingly so blind to its own interest in giving to one capitalist, who generally sub-contracts and doles out each department to a sub-contractor in each line for about the one-half what he gets, who, of course, cannot half pay his workmen, and has no interest in doing the work well, as his name is never brought into requisition: his object is only to have a certain quantity done, so as he can get the means to half pay the workmen under him, which is the cause of so many turn-outs and combinations amongst them; whereas, if the Government would subdivide the same, they would have more competition in the market, independent of the work being better done, as each trade would work with more emulation, and be accountable for its separate contract, the tradesmen under them be better paid, apprentices taught their business, a great saving to the public accrue, and good feeling, order, contentment, and comfort be created between master and man, and throughout all society. I have known in two or three recent instances in Ireland contracts given away in the stucco plastering line exclusively: of three separate Roman Catholic chapels, the works were given to carpenter contractors in place of legitimate stucco plasterer employers, which, in my mind, arose from the Government adopting this fatal system. I would suggest that Parliament ought to make a law to grant a yearly license to each individual tradesman (tested by skill and ability), say each tradesman to pay 1*l.* per year as a license, which would amount to some millions yearly: the said sum could go into the coffers of the Exchequer for the benefit of the public, or as a fund to protect the old and infirm tradesmen, many of whom are now a burthen to the poor-house relief; or it could go to educate the young orphan or tradesmen's sons in a preparatory and scientific education previous to their being bound to their trades. T. MCANASPIE.

* Since the above was set up, we have received a letter from the member from whom the suggestion of ill-feeling on our part towards the Association proceeded, stating, that information obtained by him at the Institute has altogether exonerated us from the slightest imputation of such a feeling; explaining the means by which he had been led into the error; and expressing his intention of taking the earliest opportunity of relieving the *Builder* from the charge of misrepresentation hastily made against it. The letter is marked "private," or we should have allowed the writer to speak for himself. We have also received a letter from the chairman of the meeting, Mr. Gray, repudiating in the strongest terms an untrue remark attributed to him.

METROPOLITAN BUILDING ACT.

SHOP FRONTS.

"AN INQUIRER" writes, "As there appears to be some difference of opinion respecting the interpretation to be given to clause 3, sec. 26, of the new Building Act, which stands thus;—

'No part of the woodwork of any shop-front shall be fixed *nearer* than 4½ inches from the line of junction of any adjoining premises, *unless* a pier or corbel of stone, brick, or other fireproof material, 4½ inches wide at the least, is built or fixed next to such adjoining premises, as high as such woodwork is fixed, and projects an inch at the least in front of the face thereof;'—

it would be conferring an obligation if you, or one of your numerous readers, would define the limit of deviation from the other rules of the Act permitted by the said clause."

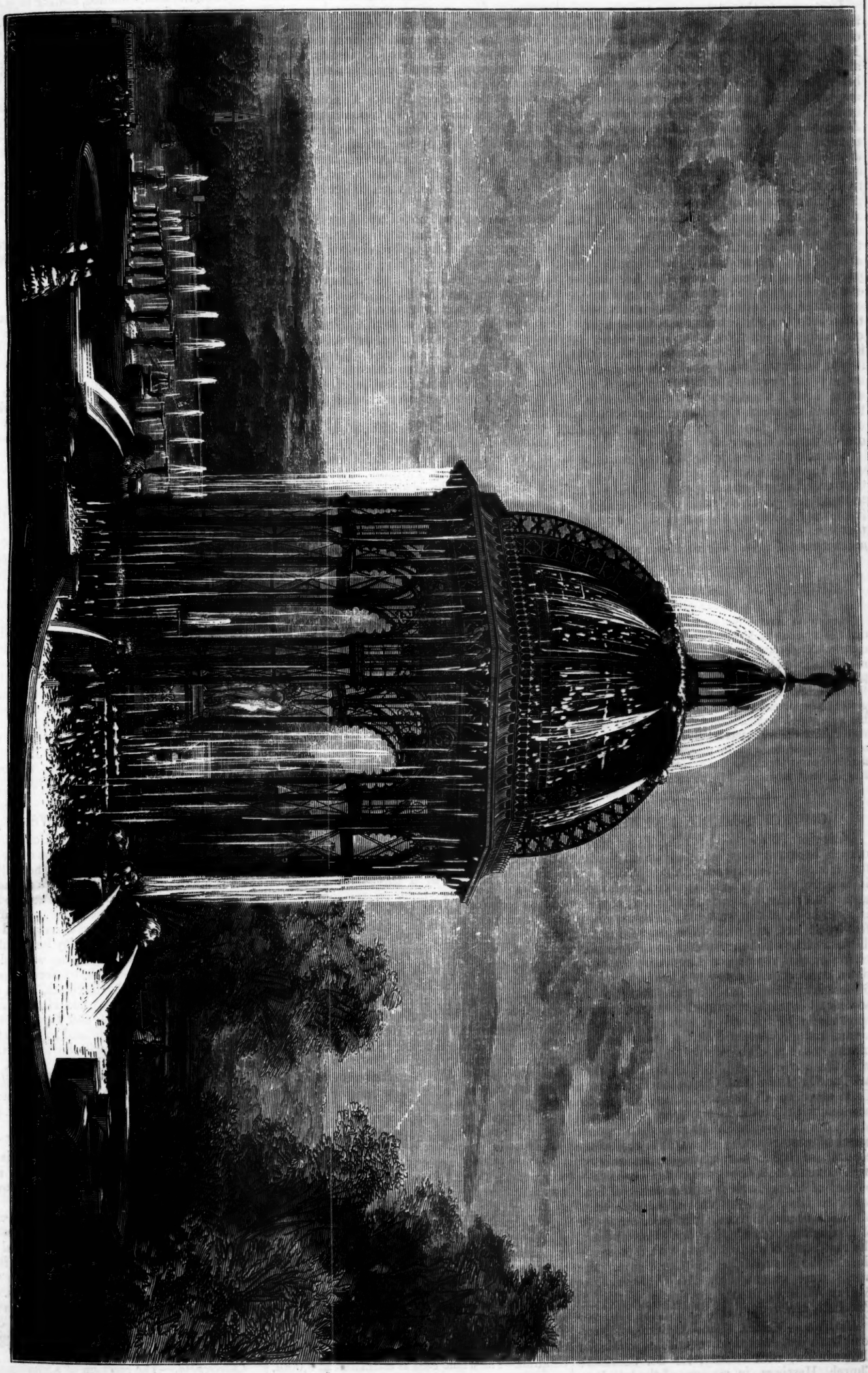
*** This is one of those obscurely-worded clauses, unfortunately not few; in the new Building Act, the exact intention of which cannot possibly be arrived at. We leave it at present for the consideration of our readers. It would seem, at all events, that the centre of the pier or corbel, of fireproof material, 4½ inches wide, may be made to range with the centre of the party-wall, notwithstanding the expression "*next* to such adjoining premises," thus permitting the woodwork to be brought within 2¼ inches of the line of junction. If it be not so, the "unless" means nothing.

BRITISH EMBASSY-HOUSES ABROAD.

THE House of Commons has refused to pass a proposed vote of 6,912*l.* for British Embassy-houses abroad. A portion of this sum, 1,627*l.* was for professional remuneration to the architect, Mr. Albano, in Paris, including personal and travelling expenses.

A correspondent animadverts on this, and says the same architect received another 294*l.* for his personal and travelling expenses in Madrid, and a further remuneration of 470*l.* "for professional services connected with the British Protestant Cemetery in the same capital."

Considering the smallness of the amount expended in both these cases (not so much, we are told, as the amount of the architect's remuneration), there seems to have been very bad management somewhere, but we are not aware of any circumstances to justify the onslaught on the architect. The Governments seem to be the parties to blame.



WATER BOWER, AT THE CRYSTAL PALACE, SYDENHAM.

[See p. 337, *ante*.

THE MANCHESTER EXHIBITION BUILDING COMPETITION.

IN answer to the advertisement of the executive committee for conducting the "Exhibition of the Art Treasures of the United Kingdom in 1857," twenty-five designs were submitted; and in addition, we are told, the committee had before them a design by a firm of operative engineers, sent in before the competition was invited. Our esteemed contemporary, the *Illustrated News*, was premature when it announced last week that the building had been entrusted to Mr. Owen Jones. Mr. Jones had submitted a design, and after receiving a visit from Mr. Deane, the manager, and giving explanations, was taken down to Manchester, and attended the committee. No question of moment, as we understand, was raised, except that of cost; and, after some negociations, the architect set this at rest, as he thought, by the production of a tender from Mr. Kennard, to carry out the design for the sum named by the committee, viz. 25,000*l.* and Mr. Jones returned to his hotel to await the minute of the committee confirming the selection. The minute came, but it was to say that, after anxious consideration, it was found that his design could not be made to suit their wants; but it was hoped they might have his assistance for the *decoration* of the building, which would be erected, probably, on the plans of the committee, rather than on one of those submitted!

The advertisement issued by the committee was a very vague one: it ought to surprise us that architects of standing were found willing to made designs on so small assurance, though it does not. The committee should remember that the competitors trusted to their honour, and act accordingly. We wait to hear more.

MIDDLESEX INDUSTRIAL SCHOOLS COMPETITION.

IN reply to several inquiries, we are enabled to say that the advising architects have furnished the Committee of Magistrates with a report, which, however, merely indicated the seven plans to which they gave the preference. They were accordingly requested to meet the committee, and also invited to furnish a report, giving the grounds of their decision; and a meeting has been called for the 23rd, "to receive this farther report from the architects relative to the seven designs selected by them, and to proceed to consider and determine to which three designs, out of the forty-one sent in, the premiums should be awarded."

CHURCH-BUILDING NEWS.

Arkesden (*Essex*).—The restoration of the church here has been effected within the last few months at an expense of about 2,500*l.* It is a large edifice, consisting of a nave, north and south aisles, a chancel, and tower, containing six bells, at the west end. The nave is 16 feet by 25 feet, and each of the aisles 56 feet by 11 feet. The old tower was in so dilapidated a condition that it was found necessary to pull it down entirely, and a new one has been erected 60 feet 10 inches in height, with a turret at the south-east angle surmounted with an octagonal spire rising 16 feet above the tower, and having a vane and gilt weathercock. The eastern part of the tower and the whole church are faced with flint stone pointed, and all the decorations are new. There are Caen-stoned windows, Caen stone to all the angles, and the roof is covered with Westmoreland slate. The seats, stalls, &c. are new, of British oak. The interior enriched roof is open; as also the roof of the chancel, of Baltic oak, stained and varnished, with carved braces on carved corbel heads. The paving of the church is of blue and buff Staffordshire tiles, and the floor of the chancel of Minton's encaustic tiles. The cathedral style of glazing has been adopted in all the windows, the east being of stained glass, with representations of the Resurrection and Crucifixion. The works were executed by Mr. C. Erswell, of Saffron Walden, from drawings by Mr. J. E. Pritchett, architect.

Hastings.—Messrs. C. and A. Gibbs, of New-road, have just erected a five-light perpendicular altar-window, with tracery, for St. Clement's Church, Hastings, in memory of the late Rev. John Goodge Foyester, twenty-two years rector of the church. The window is a foliated one, with ornamented medallions, the centre compartment containing an ornamental tree, with a label running through bearing the text,—"Blessed are the dead which die in the Lord." The new stone carved reredos and stonework of the window are from the designs of Mr. Carpenter, of Hastings.

Bromsgrove.—Holy Trinity Church, on the Lickey-hills, and near the Plymouth monument, having been completed, was consecrated on Friday before last by the Bishop of Worcester. It is in the Early English style, after plans by Mr. Henry Day, of Worcester, architect; the builder being Mr. Robinson, of Redditch. It contains 300 sittings, all free. The pews are with open ends, and are of oak-stained deal, the pulpit of Painswick stone. Mrs. John Collis, of Bromsgrove, has undertaken to colour the Decalogue and Lord's Prayer at the east end of the church. The new church and National school-rooms are erected on the summit of the Lickey. The parsonage-house, with a garden, and suitable quantity of land attached, as also the ground for the church and schools, were given by the late Hon. R. H. Clive, together with a sum towards the erections. His lady, the Baroness Windsor, has assisted in completing the work, as also another lady, Miss Phipson.

Broughton.—The foundation-stone of a new church was laid at Broughton, near Pershore, on Wednesday in last week. The Rev. Dr. Williamson, vicar of Pershore, started the project for erecting the chapel, by offering about 700*l.* towards the building and endowment. The subscriptions still fall short, however, of the required sum. The architect is Mr. W. J. Hopkins, of Worcester, and the contractors are Mr. Lacey and Mr. Snow, of Droitwich. To secure the edifice from damp, and give a firm foundation, about a yard of concrete has been laid under the walls, The plan of the chapel is a parallelogram, measuring, including the walls, 56 feet by 23 feet; and of this the eastern part, 17 feet 6 inches long, is to be cut off for a chancel by an ornamental truss in the place of a chancel arch. The roof is open. The walling is to be limestone from Wolverton quarries in the neighbourhood, with Bath stone dressings, and lined with red and white bricks. Neither plaster nor paint is to be used in the building. The south-west corner is thickened so as to form the base of a small angle turret, sustaining a belfry-chamber of timber, surmounted by a slender octagonal shingled spirelet reaching 66 feet from the ground. The east end has a three-light Geometric window: the west has two trefoil-headed lancets; and in the gable there will be a rose window. The nave will be lighted at the sides by a three-light window on the north and a two-light on the south. The chapel will hold about eighty or ninety people, for whom benches of simple design will be provided. The chancel floor will be paved with Minton's encaustic tiling. The roof of the chapel will be tiled with blue and red Broseley tiles. The contract for the structure is somewhat under 800*l.* exclusive of the land.

Silverdale.—The foundation-stone of a new chapel, for the Methodist New Connection, was held at Silverdale, near Newcastle-under-Lyne, on Monday in last week.

Lenton.—The *Notts Guardian* states that the foundation-stone of a new General Baptist Chapel for Lenton was laid on Monday in last week. The architecture will be in the Italian style, and accommodation will be provided for 484 sittings. Mr. W. H. Booker is the architect, and Mr. Joseph Hull the contractor.

Liverpool.—The chief stone of the Cranmer Wesleyan Chapel and schools at Boundary-street, Vauxhall, was laid on Thursday in last week. The chapel has got to the first floor. The designs were furnished by Mr. James Wilson, of Bath, the architect; they are in the Gothic style, slightly ornamented. A yard—one of the play-grounds of the schools—separates the two buildings. Messrs. Williams and Stone, of Liverpool, are the contractors. The chapel will seat 800, with a gallery for 250 children. The schools will accommodate 700 children. The whole cost is estimated at 9,000*l.*

——The cemetery and Episcopal chapel at Toxteth-park were consecrated on Monday in last week. The outlay on the whole has been 26,000*l.* the land, included, costing 15,000*l.* The dissenters' chapel was opened on the day of the consecration.

Bidston.—The church of this village, in the hundred of Wirral, has been restored from designs by Messrs. Hay, of Liverpool, architects; and the edifice is to be reopened on 26th instant. The estimate was 1,600*l.* The old stones have been rebuilt without any external chiselling. The windows are filled with tracery: the chancel window is of stained glass, by Mr. Watson, of Dunfermline, at a cost of 100 guineas, contributed by Mr. W. Hind and Mr. Blythe. The church is seated for 400 persons. The tower is to be repaired when funds are provided. The mason's and carpenter's work was done by Mr. H. Fisher, of Birkenhead; the plumbing, painting, and glazing by Mr. J. Holt, of Liverpool; and the plaster and slater work by Mr. W. Goodall. Mr. E. Towell was clerk of the works.

Bolton.—The opening of Lee Chapel, Horwich, took place on Wednesday in last week. This chapel, which is in the Early English style, after a design by Mr. Woodhouse, of Bolton, architect, has been erected at a cost of 1,500*l.* and is capable of seating 500 people.

Bedale.—The parish church of Bedale having been recently restored, Mr. John Buckle has contributed a stained-glass memorial window, the easternmost of the south side of the chancel. The subjects are, "Christ besought to heal the Son," and "The Centurion imploring Christ," with texts. Mr. Warrington is the artist.

Scarborough.—Plans of a new Roman Catholic church have been prepared by Messrs. Wrightmans, Hatfield, and Goldie, of Sheffield, architects, and have been open to the inspection of parties wishing to contract for the works. The building will be in the Early English style, and will be 122 feet long and 62 feet wide, with sacristy, baptistry, and two side chapels, and will be capable of holding nearly 2,000 persons.

Brechin.—The new burying-ground committee met on Tuesday in last week, when four offers were produced for the erection of a bridge across the Den; and that of Mr. Baxter was found to be the lowest, and was accepted. The building is designed by Mr. Henderson, and consists of seven arches of 12 feet span each, and the height at the centre of the Den will be about 30 feet. The roadway is 12 feet wide, and is about 150 feet in length. The contract for the building of the bridge is 492*l.*

PROVINCIAL NEWS.

Wellingborough.—The erection of a building here as a corn exchange, and for other public purposes, has been decided on. The estimated cost is 3,500*l.* of which 2,000*l.* are already promised in shares of 25*l.* each. The site is central, and near the market-place, where some dilapidated houses have just been pulled down.

Long Sutton.—On Wednesday last, a meeting of the Market House Company was held here on Wednesday in last week, to decide upon the plans forwarded to the directors, when design No. 1, of Messrs. Bellamy and Hardy, Lincoln, was unanimously adopted, and these gentlemen were appointed architects and superintendents of the erection, which will be forthwith proceeded with.

Headington-hill (*Oxford*).—The architect of the new mansion-house here for Mr. Morrell, is Mr. John Thomas (the sculptor), not Mr. Stone, as stated in our notice of the 14th inst.

Bridgnorth.—The new market hall, of which Mr. Griffith, of Quatt, is the builder, is composed of light-coloured bricks, relieved at the angles and round the doors and windows by others of a warmer and brighter tint. It is "of a mixed order," but approximates closest to the Italian.

Tamworth.—At a meeting of the local guardians, held on Saturday before last, it was unanimously resolved that a new union workhouse be erected, to hold 200 inmates. The present building will have to be sold, as a site for the new building is purchased north of the town, in an elevated spot on the Wigginton road.

Chesterfield.—The erection of a monument, in Chesterfield, to George Stephenson, has been urged. During the latter part of his life he

resided at Chesterfield, and his remains are deposited there with an ordinary stone epitaph.

Harewood.—The new national and Sunday schools, for some time past in course of erection, in the village of Weeton, Harewood, were opened on Wednesday in last week. They are situated in the centre of the village, and have been erected at an expense of about 600*l.* the whole defrayed by the Earl of Harewood. The site was also given by his lordship. The schools are in the Gothic style of architecture, and they have been erected from designs of Messrs. Mallinson and Healey, of Halifax.

Moy.—The *Tyrone Constitution* states that Mr. Dargan has been declared the contractor for the building of the Moy bridge.

Wexford.—Mr. Cowman, the contractor, has commenced the stonework of the Wexford new bridge, and the county surveyor, Mr. J. B. Farrell, has been at Dublin, to inspect the metal castings at the Irish Engineering Company's.

SIR CHARLES BARRY'S REMUNERATION.

PAYMENT OF ARCHITECTS.

AT a special meeting of the Liverpool Architectural Society, held on the 11th inst. the following resolutions were passed:—

"That after due consideration of the correspondence, printed by order of the House of Commons, on the subject of the difference between Sir Charles Barry and the Government, as to the rate of remuneration for that gentleman's services as architect of the new Palace at Westminster, this meeting is of opinion,—

That the grounds upon which is based the refusal of the rate of payment, established by long custom, of 5 per cent. are altogether untenable, and completely met by Sir Charles Barry when he argues, "that the unusual extent and importance of the work is a reason rather for increasing than diminishing the customary remuneration of the architect, inasmuch as his responsibilities are more than proportionably increased, and the demands upon his taste, skill, and judgment far greater, than in works of less magnitude and importance."

That as the great difficulties which the architect has to contend with in the practice of his art lie chiefly in the necessity of forming, out of a multitude of diverse features designed for distinct utilitarian purposes, one consistent artistic whole, we consider that his task becomes more arduous in proportion to the importance and multiformity of the edifice, and even in proportion to the expenditure, when that is incurred for the production of an elaborate style of decoration; and we deem it obvious to the common sense of mankind that the practitioner in no profession can be better entitled to his accustomed fees than the competent architect, to whom a building, however costly, is entirely indebted for its practical and artistic value, and without whose aid it must be but a lifeless mass of constructed lumber.

That, in the opinion of this meeting, this reasoning will especially apply to the new Palace at Westminster,—an edifice designed to serve practical and complex purposes of great national importance, and to display qualities which shall aid in refining and elevating the public taste.

That the refusal by the Government of the customary rate of remuneration to the architect of this work appears to us to ignore the professional rank which we claim for the practice of architecture; to be inconsistent with the paternal and fostering care which a popular Government should extend to the growing appreciation of architecture among the people, which must inevitably be impeded by any depreciation of its claims in so high a quarter, and, if persisted in, be calculated directly and seriously to injure the profession at large.

That the earnest attention of the Royal Institute of British Architects, as the chartered representatives of the profession generally, be invited to this subject, with a request that they will take such steps as may seem to them advisable to assert and maintain the due claims of the profession, as some movement on their part in the matter cannot altogether fail of effect; since, if it do not succeed in inducing the Government to reconsider the case, it will yet stand as a protest of the profession against the reduction of professional charges; whilst, on the contrary, silence with respect to it on the part of the Royal Institute of British Architects might be misconstrued into acquiescence in its justice."

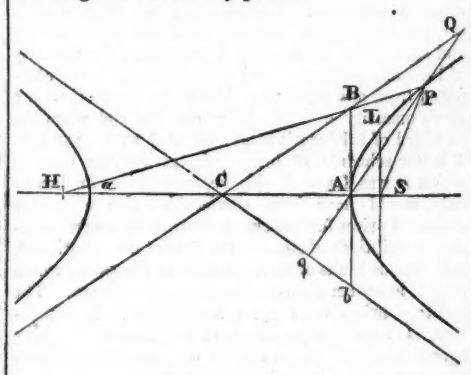
A copy was transmitted to the Honorary Secretaries of the Institute, and has been referred to a committee. We may mention that the Government, in their difference with Sir Charles Barry, rest on what they consider a bargain made in the first instance, though reluctantly, by Sir Charles, and the matter is thus made an exceptional case. It is none the less important that the Institute should protest against the arrangement offered, lest it should be adopted as a precedent. Whether or not, under the circumstances, any interference on the part of the Institute is likely to aid Sir Charles Barry in obtaining a proper settlement of his claims, we will not pretend to say; but of this we are certain, that he ought in all fairness to receive at least the customary remuneration of architects, 5 per cent. To those who urge that even the sum offered by the Government is a large one, we would say,—Divide it over the number of years during which the works have been in progress, and have for the most part absorbed the attention of the architect, and compare the annual stipend it affords, without reference to the cost of clerks, with the annual income of any first-class engineer, barrister, or physician.

GEOMETRICAL PROPERTIES OF CONIC SECTIONS.

HYPERBOLA.

THE name "Hyperbola" is applied to a curve which may be obtained from the cone by cutting it with a plane parallel to the vertical axis: the outline of the section thus obtained will be an *hyperbola*, which curve we propose to consider next in order to the ellipse, as the two curves have many similar properties.

The hyperbola may be drawn by continuous motion, as in the case of the ellipse, but as it requires an instrument to be made for the purpose, we shall only mention the method of drawing the curve "by points."



Draw the line A *a*, which call the *axis*, and draw two other lines Q C, *q* C, making equal angles with the axis at C. Take any point A on the axis as the vertex of the hyperbola; then, in order to find other points on the curve, draw any line Q A *q* through A, to meet the two lines in Q and *q*, and take Q P equal to *q* A, then P is a point on the curve; and by drawing any other lines through A, and proceeding in the same manner, we may obtain any number of points through which the hyperbola may be drawn by hand.

The two lines meeting the axis at C are called the "Asymptotes," and are so connected with the hyperbola that the curve goes on continually approaching nearer and nearer to the *asymptotes*, but never absolutely reaches them. It will be seen that by altering the angle between the asymptotes we produce different hyperbolas, just as we produce different ellipses by altering the proportion which exists between the two axes (page 6, *ante*).

The following is the relation existing between the hyperbola and its asymptotes, which enables us to find points on the curve as above: If we draw *any* chord A P of an hyperbola, and produce it each way until it meets the asymptotes in Q and *q*, then *the parts* P Q *and* A q *of the chord produced, which are cut off between the hyperbola and its asymptotes, are always equal to each other.* This rule applies to any points on the curve; so that if A is any point not necessarily the vertex, we can draw the curve by help of the asymptotes, as shown above.

It will be evident that another hyperbola equal to the former can be drawn between the asymptotes on the opposite side of C, by taking C *a* = C A, and the hyperbola is always considered as consisting of two branches, the point C being called the centre of the curve, as in the ellipse (page 6). Since we can produce the asymptotes to any length, it follows that the curve may also be produced indefinitely.

The hyperbola has foci S and H, as in the ellipse, which may be found as follows:—draw A B perpendicular to the axis, to meet the asymptote C Q in B, then make C S and C H each equal to C B. If we draw lines from S and H to any point P on the curve, there is a constant relation between S P and H P, namely, *the difference between* H P *and* S P *is always equal to the length of the axis* A *a*, to which there is a similar property in the ellipse (page 6).

The hyperbola is said to have a greater or less *eccentricity* in proportion as we increase or diminish the angle between the asymptotes, or as we alter the proportion of C B to C A. And since C S is made equal to C B, therefore the measure of the eccentricity is the ratio of C S to C A, which must always be *greater than* unity.

The ordinate S L, drawn through the focus S at right angles to the axis, is called the *latus rectum*, and has the following connection with A C and A B, namely,

S L : A B = A B : A C.

The hyperbola is a curve in which it is supposed that some of the comets revolve, having the sun in the nearer focus: such comets can of course never return to the sun after having once passed it, but will go off into infinite space.

E. W. TARN, M.A.

"HAND-RAILING SIMPLIFIED."

WE have had before us for a few days a folio work under this title, by Mr. Robert Riddell, of the United States (published by Messrs. Trubner and Co. of London), which professes to solve, amongst other things, "The grand problem, which enables the workman to exhibit at once the surface of plank on its pitching planes through the cylinder." It deserves more attention than we have yet been able to give to it, but we may say that, having had the work carefully read through by a practical "staircase hand," he agrees in opinion with us, that the use of the trammel, as proposed, instead of the ordinary method of lines, is of great importance and value to the trade, and we feel it due, therefore, to Mr. Riddell, that his plan should be properly examined into.

IMPROVEMENT OF SETTLED ESTATES.

YOU lately did me the honour to notice a small pamphlet, on the Improvement of Settled Estates, which I have circulated, in the hope of drawing public attention to a great defect in the law, and by which the advance of the agricultural art is seriously impeded. As the suggestion I made for the extension of the "Private Money Drainage Act" has been adopted by the Government, who have framed a Bill in which my views are in the main carried out, and which is now before the House of Lords, I beg again the favour of your assistance, that I may publicly state the object of the measure, and show that it is not one framed for the exclusive advantage of a particular class of proprietors, but that a question of national importance is involved.

It is very well known that a very great portion of the land of the kingdom is owned by persons having but a life-interest in it, or tenants for life. These lands and the erections upon them have in most cases been inherited by them, if not actually dilapidated, at least impoverished, antiquated, and totally insufficient for the wants of the opulent and educated tenants of this day, to whom we look to raise from our own soil some portion, at all events, of the nine millions of quarters of corn which we annually import, or, in other words, which we now employ foreign workmen to grow for us upon a foreign soil, whilst we have both workmen and land unemployed at home.

To land held under this peculiar tenure the State has long admitted that some relief was due; for whilst it was obvious that the whole community must be injuriously affected by a retrograde action in the cultivation of any portion of the soil upon which our increasing population mainly depended for the chief support of life; it was, on the other hand, admitted, that in common reason we had no right to expect from tenants for life the enormous and immediate pecuniary sacrifices that must be attendant upon the costly works of drainage and other improvements essentially necessary to permanently increase the fertility of the soil; and for which outlay it must be borne in mind the immediate owner, with scarcely a hope of being reimbursed, even if he enjoyed the estate to a good old age, had no claim whatever upon his successors.

Two public Acts were therefore passed in the years 1846 and 1849 (9 & 10 Vict. c. 101, and 12 & 13 Vict. c. 100), enabling tenants for life to borrow and expend money in draining land (under the direction of the Inclosure Commissioners), and pay it by an annual rent-charge secured upon the estate improved for a definite term of years; so that whoever might possess the estate during that term would have to pay the annual charge, and also enjoy the improvement. By this wise arrangement it will be perceived that the owner making the improvements was relieved from an immediate outlay, which, in case of his death,

might have been lost to his family; and an equitable payment of a portion of the outlay from every person who might own the estate during the continuance of the rent-charge was secured.

The justice and the policy of this principle soon became apparent, and it was found that it might be safely and advantageously extended to the execution of other works quite as important as draining; such as good farm-roads, improved buildings, enlarged houses, embanking, irrigating, &c. But the administration was slow to secure the advantage to the public, and the need was merely registered by them for future consideration as a desirable object that it was the especial business of no one in particular to obtain. But private enterprise viewed the experience gained in a different light, and seeing that profit might be realized, took advantage of the inactivity of the Legislature, and formed private companies, by whom special Acts of Parliament were obtained, empowering them to create rent-charges upon land for the works above named. As this privilege was granted exclusively to the companies a monopoly was created, which has been to this day retained; and it results, that although a tenant for life may borrow or advance money for draining with the sanction of the Inclosure Commissioners, and make a charge on his estate for the amount so expended, yet the commissioners can themselves, in no case, make a charge on land for any of the other works above named. The companies alone can do this, because they alone have obtained the necessary powers from Parliament, and they charge every applicant 3 per cent. on the amount of his outlay for the use of their Act in making this charge. Still no reason can possibly be assigned why a landowner should not do all he may require directly with the commissioners, as in the case of drainage, and save his 3 per cent. and the unnecessary intervention of the company. I see no objection to the employment of a company to effect the arrangement if a landowner is disposed to engage such an agent; but I say it is monstrous to compel all to travel out of their way to accept such unnecessary and costly service.

But the Government is now alive to this, and a Bill has been prepared, which will soon become law if the popular voice is raised in its favour: it is known as the "Drainage (Private Advances) Act Amendment," and is before a select committee of the Lords, having been read a second time. Its provisions are simply to empower a landowner to do for himself directly with the Inclosure Commissioners, without the intervention of any third person, as much as he can now do with the commissioners through a company, so that he may no longer be compelled to pay 3 per cent. upon his outlay for services he may not need.

I have long advocated this measure, having in course of my practice experienced the necessity for it; and I wish now to bring the Bill under the notice of the public, and particularly of landowners having seats in the House of Peers.—CHAS. F. HUMBERT.

COVENTRY NEW CORN EXCHANGE AND MUSIC-HALL.

THIS building was inaugurated by a public dinner, on the 20th ult.—Lord Leigh, the Lord Lieutenant of the county of Warwick, being in the chair,—at which upwards of 400 persons attended; more than 200 ladies being present as spectators. The site selected is a very peculiar one, and the architect had to exert ingenuity to surmount the obstacles arising. The style chosen is Italian, with detail partaking of the Romanesque, brick and stone being the principal constructive materials of the front. The principal entrance is in the centre of the front, and consists of a columnar recessed portico, which is continued the whole height of the front, and is divided by the floor of the first story, which forms a gallery of semicircular shape over the entrance. The exchange-room is entered from a hexagon vestibule, and the first impression is one of surprise at finding so large a hall as is the principal one of the building come upon one so unexpectedly. The dimensions are 110 feet in length, by 55 in breadth, and 46 feet the height: the extreme width of the exchange-room across the galleries is about 74 feet. This is, we believe, the largest interior yet constructed for the purposes of a corn exchange, and its noble size suggests its future frequent use for the purpose of musical festivals, for which, we are informed, it has already proved itself to be well adapted. The entrance end of the room is semicircular: the opposite one is of elliptical form, intended to receive an organ and orchestra: the galleries, which are arcaded, run nearly round the interior, except the organ end, having corridors under, on the ground floor. The roof, or ceiling, is also elliptical and panelled, two rows of the panels being filled with glass, the others having appropriate plastic enrichments, emblematical of music, agriculture, &c. At night the hall is lighted by three gas sunlights in the ceiling. The front building contains five large shops on the ground floor, with assembly rooms, &c. in the two upper stories, which latter are connected with the galleries in the hall, an arrangement likely to prove advantageous when it is used for balls and musical meetings. Mr. James Murray, of Coventry, is the architect. The cost, including ventilation, gas, and other general fittings, together with stabling for the adjoining hotel, which, we should perhaps mention, runs under the whole of the main building of the exchange, was about 7,600*l.*

BUILDERS' PRICES.

Two years ago I sent you some remarks on builders' price-books, and suggestions for improving the same. I find that a Master Builders' Association, in the Midland Counties, have issued a "Local Price-Book." The attempt is praiseworthy, but I cannot say much as to the manner in which it is carried out. There are several blunders in the classification, and the bulk of the contents seems to have been copied from London publications, there being but a very small portion relating to local matters, and that without the usual explanations. In comparing the price of mortar, per hod and per barrow, with the prices of lime and sand, there is a great discrepancy: the quantity of lime and sand to a rod of brickwork, is not computed from any particular lime in the district, with a given quantity of sand (why use the rod when the standard of brickwork is a rood of 7 super. yards?). A better schedule of brickwork, giving the data on which it was founded, also separate prices for labour only, would have been serviceable; also a greater variety of prices for stonework, there being several valuable descriptions of stone in the district not mentioned, and various kinds of work peculiar to the same, which might have been advantageously introduced. The painters' prices want great reformation. In conclusion, I hope the members of the Association have agreed to adopt this standard of prices in their contracts as well as in their ordinary charges. Z.

ST. JOSEPH'S ROMAN CATHOLIC INSTITUTION FOR THE DEAF AND DUMB, CABRA, DUBLIN.

THE ceremony of laying the foundation stone of the above asylum was performed on Tuesday, the 9th inst. by the Archbishop of Dublin, in presence of a large number of the clergy and laity, the celebrated band of the Tipperary militia being in attendance, and an extensive platform and numerous tents having been provided for the accommodation of the spectators.

The building, which is of Tudor character, is to be erected of rubble limestone masonry, pebble-dashed, having the quoins, cornices, window dressings, &c. of red bricks, from Wexford, and the window sills, corbels, gable crosses, copings, &c. of County Dublin granite. The schools and dormitories will measure 67 feet by 32 feet, the flooring being formed of 3-inch deals, supported on wrought trellis iron girders, without joists. The central erection consists of apartments for chaplain, head-master, junior masters, and domestics; and the wings, when completed, are intended to afford beds for 200 children, with school-rooms, play and trades rooms, refectory, kitchen, offices, &c.

The contract for present works taken by the Messrs. Beardwood, amounts to 5,000*l.* and the designs are to be carried out under the direction of the architect, Mr. Charles Geoghegan.

THE SATURDAY HALF-HOLIDAY.

THIS boon has been conceded in Manchester to almost all classes of people, in Bradford also, and to at least professional men in Leeds; but in London there seems to have been as yet no step taken to close, as a general rule, all offices at an early hour on Saturday afternoon.

For more than two years I occupied a situation in a London office, and I can affirm now (after the lapse of five times that period) my sure belief that nothing would have been so gratefully received, nothing so beneficial to my health and feelings, nothing so calculated to increase my efficiency and retain me in the position of a cheerful worker, as the concession of the Saturday half-holiday.

My residence was at the extremity of Kensington-gardens, my daily walk through these and Hyde-park; yet the consequence of the unceasing round of duty was this, that the rest of Sunday served only, in the *feverish atmosphere of London*, to recruit my physical system for the succeeding three days, and left me subject to headaches, and other symptoms of a body out of sorts, and to the depressions and discontentments consequent thereon, for the remaining three.

I should, I believe, have been glad to purchase the remission of three or four hours on Saturday by extra time upon the other days of the week; but I question whether it is not quite as much the interest of the employer to grant freely the half-holiday, on account of the extra energy infused into the system, as it is of the employed to obtain it. In factories, as you are aware, where shorter hours have been conceded, the engine has been increased a corresponding per-centage in speed, and the loss recovered.

May the young men of our profession, when they obtain, as I hope and trust they soon will, the boon in question, imitate this example, and work with energy while they do work, but also forget not to *rest* when they ought. L. L.

POLYCHROMATIC GLASS.

SOME results have been submitted to us of an invention by Mr. Burridge, which has for its object the introduction of an entirely new description of coloured glass, adapted to useful as well as ornamental purposes, for which a transparent coloured glass, or a transparent and opaque coloured glass combined, is required. It consists in this,—that plates of glass being formed with a different colour on each side, patterns are removed by an acid, and give either one or other of the colours, pure white, or combinations of the two colours, according to the thickness of each left. It is applicable for the windows, walls, and ceilings of buildings in every style of architecture, and supersedes the necessity for any kind of lead-work. Glass thus decorated has a peculiar richness and brilliancy. The invention certainly deserves attention.

BUILDERS' BILLS.

Re SCHMOLLINGER AND BRAKE.

IN your publication of June 7th, some statements are made under the above heading which I cannot allow to pass unnoticed, although not interested therein beyond a desire not to allow reflections to be thrown upon one who is undeserving of them; and as I have had the pleasure of knowing and been known to you for upwards of eighteen years, and am well aware of your inherent love of justice and fair-play, so frequently acknowledged during your editorship of your excellent journal, I am very certain you will not deny me the opportunity.

Mr. S. was, I understand, the owner of the ground in question, and his fault has been placing too much confidence in man, and believing that all men with whom he came in contact were as well disposed as himself; and I dare to say, if you were to make personal inquiries among the majority of those to whom he is known, you would find a general testimony on their part to his straightforward conduct and integrity of manner.

A recital of the facts connected herewith would, I feel assured, lead you to a very different conclusion from that communicated to you; and although it has been his misfortune to have the award given against him, still the decision is not what could have been anticipated. The reason for his declaration of bankruptcy was the fact, that claims to the tune of upwards of 1,000*l.* independently of the costs of the other side, were being pressed upon him, and he desired that his creditors should equally participate in the residue of what was left him,—which an injudicious interference in building speculations had reduced to a small amount,—as you will not be much surprised to learn when I inform you that the action and arbitration were protracted for nearly two years, and the property, although since completed by another builder, has never yet been let. VERITAS.

THE METROPOLITAN BOARD OF WORKS.

AT a previous meeting of the Board, Mr. Carpmael moved the adoption of the report of the engineer, in so far as it related to the upper level and middle level sewers and other branches *north* of the Thames. This gave rise to a debate which was eventually adjourned. On its resumption on Tuesday, 17th, Mr. Leslie moved, as an amendment, that it was not expedient to discuss the northern drainage plan, proposed by the engineers, in sections, while the point of outlet remained undetermined, as that was the basis of the whole calculation, and the efficiency of the entire scheme depended upon it. After a long discussion the amendment was negatived by 13 to 6, and the original motion of Mr. Carpmael carried. Mr. Carpmael then moved the adoption of the report of the engineer, so far as it related to the western district and the construction of deodorizing works. Mr. Leslie opposed the motion, on the ground that it was altogether contrary to the Act of Parliament, which required them to remove the sewage entirely from the metropolis. The motion was lost. Mr. Carpmael next moved the adoption of the alternative proposition of the engineer in reference to the western district, which contemplates the construction of works suitable for pumping the sewage and rain water into the low level sewer. To this Mr. Hawkes proposed an amend-

ment that the Board proceed at once to the consideration of the outfall, and that the question stand adjourned until that point be decided. This amendment was negatived, and the original carried by 18 to 5. Mr. Carpmael moved the adoption of the engineer's report, so far as it related to the extension of Barking Creek. An amendment to this, by Mr. Savage, that no plan for the drainage of the metropolis north of the Thames could be deemed satisfactory which proposed an outfall within the metropolis, was lost by 15 to 10, and the original motion was affirmed. Mr. Carpmael next moved a reference to the Committee of Works of the report of the engineer, so far as it related to the low-level sewer, for their consideration and report. To this an amendment was moved by Mr. Ware, and seconded by Mr. Seeley, that a deputation of five members of the Board be appointed to wait on the Government to know whether their co-operation could be secured in reference to a plan for the embankment of the Thames. At this point, the debate was adjourned until Thursday next.

Notices of Books.

Ancient Crosses and other Antiquities in the West of Cornwall; drawn and engraved by J. T. BLIGHT. London: Simpkin, Marshall, and Co. 1856.

THIS is a small quarto volume of illustrations intended to preserve the forms of the Cornwall crosses, which are gradually disappearing,—not from natural decay, for they are in general made of enduring granite, but from mutilation and destruction by the ignorant and mischievous. The book contains illustrations of a great many of those still in a comparatively entire state. They are divided into examples of the Greek, Transition, Latin, and Gothic crosses; and appended are other illustrations, of Celtic, Druidical, and Roman remains, with brief descriptive details annexed to each view, and a few introductory remarks prefixed to the whole; and though the illustrations are scarcely up to the mark of present requirements, the volume forms a very useful record.

The Churches of Essex, architecturally described and illustrated. By GEO. BUCKLER, Architect. Parts I. and II. London: Bell and Daldy. 1856.

THE two parts of Mr. Buckler's work already published, contain accounts of Margaretting Church, Broomfield Church (with round tower), South Ockenden Church (also with round tower), Fryerning Church, and Mucking Church. It promises to supply a want, for, as the writer observes, "the authors of the Histories of Essex seem really to have overlooked the Architecture of the churches." Judging from the parts before us, the illustrations seem scarcely to go far enough: we would suggest the desirability of making them more complete; meanwhile, we recommend it to our readers.

Miscellanea.

PORTABLE THEATRE FOR ST. GEORGE'S HALL, BRADFORD.—It has been proposed to adapt this hall for operatic purposes. A beautiful little model has been prepared by Messrs. Grieve and Telbin, of London, of a portable erection which might be placed at the orchestra end of the hall (without in the slightest degree interfering with the structure of the building), and which included all the scenery, stage-fittings, &c. required for the performance of operas of the first class. It was stated that the whole outlay, including gas-fittings, would be only 630*l.* and that, as several parties had intimated their willingness to subscribe towards such an object, there was a probability that the whole amount might be raised without any outlay on the part of the shareholders. It has been justly urged that the hall was intended to be used for any object which would tend to the rational and innocent amusement of the people, and shall be glad to hear that the proposal is adopted.

WALLACE MONUMENT.—A meeting of gentlemen interested in this movement, lately inaugurated at Stirling, took place on Thursday, 12th inst. in the Queen's Hotel, when it was resolved that, recognising the duty of the citizens of Glasgow to take an active part in any well-conceived proposal for erecting an appropriate monument to the memory of Sir William Wallace, the citizens now present do pledge themselves to give their cordial support to the movement which has been initiated for the erection of a monument on the Abbey Craig, Stirling.

BRITISH SCULPTORS.—The vote of 17,500*l.* agreed to by the Commons in committee of supply, for the Scutari monument, designed and executed by Baron Marochetti, and now on its way to the East, has excited much adverse comment. The Sculptors' Institute, as our readers may have observed, has addressed a memorial to Sir Benjamin Hall on the state of sculptural art in England, in which, guarding themselves against any imputation of illiberal jealousy, they deprecate the unmerited neglect into which native talent seems to have fallen, and submit that public competitions, before a committee so constituted as to give confidence both to artists and to the public, ought to be instituted, so that foreign artists might at least be made to enter into fair competition with those of England, the models of every competitor being publicly exhibited before selection by the committee. The memorial is signed by all the principal sculptors of this country. More than one eminent sculptor has stated that the sum paid for the Scutari monument, which certainly betrays no great stretch of genius, is exorbitant.

THE POLYTECHNIC INSTITUTION, REGENT-STREET.—The lessee of the Polytechnic, Mr. Pepper, has issued a prospectus of a new course of Monday evening lectures, which opened on the 16th inst. with one by Mr. H. Mayhew, on the Curiosities of Life among the Labourers and Poor of London. The next (on the 23rd inst.) will be on Schools of Design and other Means of cultivating the Fine Arts, by Mr. Jacob Bell; and amongst the subsequent lectures of the course is one to be delivered on 4th August, on the Teachings of the Courts of the Crystal Palace, by the Rev. Charles Boutell.

PRIOR PARK ESTATE, BATH, is to be sold on the 24th by Messrs. Daniel Smith and Son. Tunstall, in his "Rambles Round Bath," states that "in 1738 John Wood, the celebrated Bath architect, who designed the Lansdowne-crescent, Circus, and many other fine buildings in and near Bath, received a commission from Ralph Allen, esq. to spare no expense in the erection of a mansion at Prior-park, to show to the world the capabilities of the Bath stone, which, on its introduction about that time, had been rejected by the London architects." It would be useful to know its actual and exact condition now, especially if the quarry can be identified.

ST. JAMES'S-PARK.—On 13th inst. Lord Palmerston, in committee of supply, moved for votes for the proposed improvements, and in the course of his remarks stated, that when the committee of supply before rejected or postponed the vote for the road, her Majesty, anxious to promote the public convenience, at once consented to give up a portion of the garden of St. James's Palace, in order that a straight road might be carried from the iron gate between Marlborough House and St. James's Palace, and thence across the bridge to be erected over the water. The estimate for the road, for a large footway, for rebuilding the wall at Marlborough House, and carrying it to the end of St. James's-garden, and for putting a railing at the back of the Ambassador's-court, and erecting lamps on the road leading to the bridge, would be 4,500*l.*, and that for the erection of the foot-bridge across the water would be 3,500*l.* After some discussion the vote for the road was agreed to without a division, and that for a bridge was carried by a vote of 182 against 95. A very fair and satisfactory decision has thus been come to in regard to these improvements, and the necessity of undermining the Duke of York's Column or removing either it or the German Chapel has been happily obviated by her Majesty's readiness to promote the public interests and convenience in the opening of the park to the public.

THE ADVANCEMENT OF SCIENCE.—In the Commons, on 10th inst. Mr. Heywood moved for a select committee to inquire what public measures can be adopted to advance science and improve the position of its cultivators. Some discussion, and four attempts to "count out" the house, took place, in the midst of which the Chancellor of the Exchequer objected to the proposal, on the ground that, as regarded the materials of science, its cultivators had no reason to complain; and Lord Stanley advised a reconsideration of the motion next session, as no specific measure was proposed; while Mr. Tite supported the motion, and suggested a Board of Science as a means of advancing science; and Lord Palmerston expressed doubts on this and other suggestions, and hoped a division would not be pressed. Ultimately Mr. Heywood withdrew his motion.

THE BOARD OF INLAND REVENUE AND THE SOCIETY OF ARTS.—Mr. John Wood, the chairman of the Board of Inland Revenue, has placed two appointments annually in the surveying department of the Excise at the disposal of the council of the Society of Arts. No candidate will be recommended for these appointments who shall not obtain second-class certificates, at least, in mathematics, chemistry, English composition, and writing from dictation.—*Civil Service Gazette.*

THE PEOPLE'S PARK FOR WOLVERHAMPTON.—Active and determined efforts are being made at Wolverhampton, to realize the project of a public park to which we have already alluded. In an able address, signed H. Beckett, president of the committee of working men elected at the public meeting originating the movement, the project thus assumes a definite form and outline:—Twenty acres of land should be selected, and it is hoped will be readily obtained in a healthy site removed from building land, although the park will raise the adjoining land fourfold in value for building. The purchase is estimated at 4,000*l.*; and the requisite draining, planting, fencing, &c. 2,500*l.* more; or, in all, 6,500*l.* The address suggests, that the money expended in a single pint of ale per week, by the 10,000 families of working men in Wolverhampton, for twelve months, would actually accomplish the end in view; and that if the remaining 2,000 families would only refrain from one bottle of wine each per week, a sum of 20,800*l.* might even be realized. The park would be for all classes. Why should not all contribute? All, doubtless, will contribute; for a project urged on with a will, as this one seems to be, is infectious, and the desire is likely to seize all classes, and to continue till the object in view be realized, as we earnestly trust it will be.

RAZING RUINOUS BUILDINGS.—Mr. Milner Gibson, M.P. as owner, and Mr. James Sutton, as occupier, of a house, No. 82, in West Smithfield, were summoned, on 12th inst. to Guildhall, and ordered to pull down the house in question in seven days, or, in default, the City Commissioners of Sewers to complete the work for them. Two adjoining houses, in an equally ruinous condition, were to be seen to by the solicitor for the Commissioners.——The Rev. George Last, and others, the owners of a house, No. 34, Farringdon-street, and Mrs. Burdett, as occupier, till 24th inst. were also ordered to pull down the house in fourteen days.——The occupiers of No. 120, Aldersgate-street, and house adjoining, were ordered to take down a dangerous party-wall in seven days.

APPROACHING IMPROVEMENTS OF CAREY-STREET.—A sale is now taking place of the building materials of a large block of property at the corner of Carey-street and Chancery-lane, which I believe is for the purpose of clearing the ground, for the erection of one of our principal insurance offices. I would ask, Has the line of frontage been determined upon? When the projected street was proposed by Government, it was determined to take an angular piece of the ground into the street to widen it. Would it not be as well if our Metropolitan Board of Works were to make such a matter one of consideration, rather than permit a noble structure, such as is proposed, to be built on the present line, where it would be hemmed in, and form an obstacle to the much-desired thoroughfare. I dont suppose that the freeholders will propose to give up any of their ground, and if no movement is made to get the required strip, it will no doubt occasion general disappointment, and I think that you will agree with me that such a chance should not be lost sight of. The principal frontage is in Carey-street, and is, as I believe, intended to be a building with two wings, and of handsome elevation; but it will be much out of place unless it is set back, constantly shaken by railway waggons, the footway being only 2 feet 9 inches, and the carriage-way with not room for two carriages to go abreast.—F.

STREET LETTERINGS.—As the fresh naming of streets is contemplated, it may be useful to mention the letters we have seen prepared at Mr. Minton's establishment. Some six inches high encaustic (white inlaid on black), have been for eight or nine years in use by the Bedford Paving Commissioners. These letters are made of the height of one or two courses of brickwork, to admit of their being let into the wall itself—a mode far preferable to the present exhibition of rusty-iron framework. Another letter is of a vitrified stone body, the coloured ground being burnt into the surface of the tile. The public is certainly entitled to all the information to be derived from a perfect system of street nomenclature: one should neither be condemned to stumble upon a Charles street at every hundred yards, nor have to call in imagination to make perfect what is now too frequently in a fragmentary state from frost or juvenile casualties, which the bulk of the letters in use are quite unable to withstand.

EXHIBITION OF THE FINE ARTS, BRISTOL.—The annual exhibition of the Bristol Academy for the Promotion of the Fine Arts, was opened to the public on Monday, the 9th. The productions are pretty equally divided between oil paintings and water-colour drawings, and, including eight architectural drawings, they amount altogether to 176.

METROPOLITAN TOLLS.—A select committee of the House of Commons has been appointed to inquire into these nuisances and obstructions. Lord Lonsdale, the chairman of the Middlesex Commission, has already intimated his anxiety that the parishes should take to the roads and relieve the commissioners.

LECTURE AT SHEFFIELD ON ROME AND ITS ANTIQUITIES.—A lecture was delivered in the New Queen-street National School-room, Sheffield, lately, before the members of the Church of England Educational Institute and their friends, by Mr. T. R. Smith, Associate of the Royal Institute of British Architects. The subject was Rome, and its Antiquities, illustrated by photographic views, and the attendance (according to the local *Independent*) was extremely good.

CHURCH STRUCK BY LIGHTNING. — During a thunder-storm on the 27th ult. the spire of Hemingbrough Church was struck by lightning, and so much damaged that it is feared a considerable portion of it will have to be taken down. The lightning passed through the spire and tower into the body of the church, and, taking an easterly direction, destroyed some of the interior fittings, and displaced two large stones in the main wall of the chancel. The lofty spire of this church is commonly called "Hemingbrough Broach," and is locally considered one of the best proportioned in the kingdom. The date of its erection is supposed to be about the middle of the fifteenth century.

OPENING OF NEW DOCKS AT WEST HARTLEPOOL. — The third dock at West Hartlepool, together with a graving dock, &c. have been opened in the midst of great rejoicings and festivities. At a general meeting of the proprietors of the West Hartlepool Harbour and Railway, held previous to the opening of the Swainson Dock, it appeared from the report read that the revenue of the company had increased during the last year in every department of trade; the income being 146,952*l.* 10s. 1d. showing an increase of 10,178*l.* over the preceding year. At present the company's harbour and dock works consist of—the tidal or outer harbour, 44 acres; first dock (coal), 8 acres; second (coal and merchandize), 14 acres; and third (for merchandize solely), 10 acres; besides 10 acres for timber float and store yards, with two graving docks, one 320 feet and the other 350 feet in length. The harbour, docks, quays, staiths, and terminal dock arrangements occupy a total space of 145 acres, which has been covered in little more than eight years. For the conversion of the bay of Hartlepool into a harbour of refuge, the directors stated that an Act of Parliament was obtained, and the port commissioners intend to construct two large piers or breakwaters to shelter the entire bay, and thus form an outer harbour of nearly 1,000 acres in extent, which will be accessible to the largest merchant ships on the coast in all weathers and states of the tide.

GAS.—The Plymouth Gas Company, according to the local *Times* is about to divide 10 per cent. on old shares, and 7½ on new ones, and as they cannot divide more than 10 per cent. the price of their gas, it is said, will be reduced from 5s. to 4s. 6d. per 1,000 cubic feet.——A gas company has been formed at Staveley, and works are about to be erected from designs by Mr. Cashin, of Sheffield, C.E.——The attempt to establish a new gas company in Willenhall is progressing successfully, though the old company have reduced their price to 5s. 6d. There is talk of the old company selling their works to the new, as well as of the very usual "amalgamation" between the two. A reduction of price to 4s. 6d. seems to be the point aimed at by the gas consumers of Willenhall.——Mr. Wm. Basford, of Pencliwdd, has patented an invention for purifying coal gas, and obtaining a residuum therefrom. It consists in causing the gas when made to pass through vessels filled with any of the various charcoals, and heated; by preference charcoal made from wood, which is previously immersed in a strong solution of lime water for not less than fifteen minutes, and afterwards called prepared charcoal.

DEATH OF MR. BRINE, SURVEYOR TO THE BIRKENHEAD COMMISSIONERS.—We regret to have to record the demise of Mr. J. A. Brine, who for about twelve years fulfilled the important duties of surveyor to the Birkenhead Commissioners.

THE WESTMINSTER CLOCK. — Would not the Westminster clock be rendered more effective if a transparent red light could be placed at the extremity of each hand.—T.

UNITED SERVICE INSTITUTION.—At a meeting held on the 16th instant, a paper was read by Col. Twemlow, "On the Proper Season for Felling Oak Timber."

CARLISLE SURVEYORSHIP.—The Local Board of Health last week considered the subject of the appointment of a City surveyor, in the place of the late Mr. Hogg, when after some discussion it was resolved, by a majority of 16 to 10, to recommend Mr. McKie to the council for the appointment. Two names were voted for,—16 for Mr. McKie, and 10 for Mr. Gordon. On a question as regarded salary, a motion in favour of 150*l.* was rejected by a majority of 15 to 12, and 180*l.* recommended to the council by a majority of 17 against 10.

ELECTRO-TELEGRAPHIC PROGRESS.—Mr. J. Jones, of St. Asaph, Flint, has obtained provisional protection for improvements in telegraphs, by which a *fac simile* of the message is recorded simultaneously on the transmitting and receiving instruments, so that the sender may know immediately, and without the trouble of repeating, whether his message has reached its destination correctly. ——Mr. Thomas Allen, of London, C.E. has prepared a telegraphic wire of iron insulated with a new flexible material, sufficiently strong, it is said, to afford full protection, the whole weighing in some cases as little as one-tenth of the common wire, though having a conducting power three or even five-fold greater, while the relative proportion of strength in the wire is increased to a considerable degree.——Mr. William Brown, of Australia, has made an offer to the Government to erect an electric telegraph from Mount Louis to Hobart Town, thence to Launceston and George Town, and to complete the whole within nine months from signing the contract, for 16,000*l.*——The screw-steamer *Propontis*, Capt. Goodwin, was lately at Queenstown, with the submarine electric cable to be laid down between Cape Ray, Newfoundland, and Cape North, Breton Island. The length of this cable is eighty-five miles, and its weight 170 tons. She has also on board the cable to be laid down between Cape Traverse, Prince Edward's Island, and Cape Formantino, New Brunswick,—length thirteen miles, and weight thirty tons. The cables were manufactured and are to be laid down by Messrs. W. Kuper and Co. of London, under direction of Mr. Canning, who, with his assistants, is on board.

AN IRON MONUMENT FOR THE IRON DUKE.—Having seen that a monument is about to be erected to the illustrious warrior in this our iron age of railways, palaces, suspension and tubular bridges, let me ask, Why should not the memory of the man be perpetuated in the material to which he was likened? In former ages, if we look into the memorials of the past, either at home or abroad, we find that our forefathers have left us specimens of their skill in the development of the same material. At home, in the chapel of Bishop West, at Ely; in the tomb of Edward IV. at Windsor; in the doors of Merton College, Oxford; at Bury St. Edmund's, at Westminster, at Leighton Buzzard, and the gates of the printing-office, Oxford; or abroad, in the cities of Munich, Brussels, Paris, Cologne, Liége, Rouen, Nuremberg, and the Grille of Sta. Maria, at Rome, &c. Why should it not be put forward for public competition, and the worker in metal be allowed to compete with the sculptor and the mason as in former ages? Are the works of the past not to be appreciated, which have stood the test of time? or are England and her artizans who build her iron ships and her locomotives, and send them over the face of the whole earth to defy competition in the construction, not worthy to erect a work of art to commemorate the greatest warrior of their age?—J. A.

BARN FLOORS.—With reference to "G. D. P.'s" inquiry concerning the means to remove moisture from asphalte barn floors, allow me to say, the moisture he complains of is caused by the damp vapour of the atmosphere being condensed on the surface of the asphalte floor, and not from its rising up through the same, as no dampness or moisture will penetrate through it if it is good material. The following method was carried out more than three years ago, in laying down the basement floors of an extensive range of first-class buildings in London. The ground underneath the floors intended to be laid was first well rammed down and regulated, on which a bed of concrete, 4 inches thick, was laid, to an even and level surface. Sleeper joists, 3½ inches deep, and 2½ inches thick, coated on the two sides and bottom edge with ashphalte, were then laid down on the concrete, at a distance of 12 inches apart. The spaces between the joists were then filled in with concrete, to within ¾ of an inch of the top of the joists. A layer of asphalte, ¼ of an inch thick was then spread over the surface of the concrete, thus forming a level floor of the asphalte and top of the joists, and securing a coat of asphalte between every part of the concrete and floor timber. Floor boards were then nailed or screwed down to the joists, completing the floors, which are now as free from dampness, moisture, and vermin, as when they were first laid down. The timber should be well seasoned before being used.—A. P.

LABOUR IN CANADA.—The *Canadian News* says: For three or four years past labour has been scarce and dear in Canada. The great public works, such as the Grand Trunk Railway, which will cause, from first to last, an expenditure something like 11,000,000*l.* sterling, have absorbed all the available labour, and raised it to an unusually high figure. Railway labourers have fetched from 4s. to 5s. sterling a day, and mechanical labour has been proportionably high. The great amount of extra labour employed on the railways has given the farmers a profitable consuming population.

MANUFACTURE OF IRON RODS, BARS, HOOPS, &c.—Messrs. Hocroft and Forrest, of Tividale and Tipton, have obtained provisional protection for improvements, which consist in piling together iron bars, and then rolling them down to one bar, which is slit into rods, either of one or more sizes, and at the same heat passed through rolls, with grooves, producing various descriptions of iron, such as two lengths of hoop iron and one of round simultaneously. By these means the bolting and breaking down processes may be dispensed with, and waste and heatings saved.

COOKING WITHOUT FIRE.—The *Scientific American* describes a plan for cooking without a fire. The invention is a combination of tin cooking dishes, placed one above another, the bottom of one vessel fitting on the top part of the dish below. In the lower dish of all a small quantity of quicklime is placed, and then, by means of a tube, cold water is introduced upon the lime. Chemical action generates intense heat, whereby the articles on the dishes are quickly cooked, ready for the table.

LETTER-BOXES. — Some compulsory enactment requiring letter-openings for all street-doors is very necessary. Being an observant individual, I not unfrequently see that for four, five, and six minutes, the postman has to wait unnecessarily at various street-doors. A double loss is entailed by the want of this very simple expedient: much unnecessary labour is entailed on the postman, with expense to Government and the ratepayers, and delay and inconvenience to the general public.—PAULATIM.

TENDERS

For the erection of a Warehouse Building, in Cannon-street West, for Messrs. C. Nicholson and Company. Mr. Richard Roberts, architect. The quantities supplied:—

Kelk	£11,760 0 0
Holland	11,270 0 0
Lucas	10,970 0 0
Haward and Nixon	10,835 0 0
R. Lawrence	10,699 0 0
Haynes and Eyre	10,575 0 0
Jay	10,326 0 0
Browne and Co.	10,263 0 0
Lawrence (Brothers)	10,120 0 0
Willson	9,988 0 0
Myers	9,751 0 0
Downs	8,926 0 0

Opened by the Guardians at the Aylesford Union, at Strood, on the 29th ult.:—

Gerrett and Colegate	£3,261 0 0
Wm. Jenner	3,176 10 0
Wm. Cobb	3,220 0 0
Geo. Cobb	3,080 0 0
Thompson and Crosswell	2,998 0 0
Chas. Collins	2,971 0 0
Thos. Thompson	2,900 0 0
John Goodwin	2,879 0 0
Geo. Cotton	2,832 0 0
John Diggle	2,800 0 0
Clements	2,914 0 0
Lilley	2,794 0 0
Kirk and Parry	2,774 0 0
Naylor	2,697 0 0
Spicer (accepted)	2,650 0 0

For a new Church at Enfield, Middlesex. Mr. St. Aubyn, Architect:—

Smith and Co. London	£1,983 0 0
Patman and Co. Enfield	1,874 0 0
Cushing, Enfield	1,815 0 0

For a pair of Villas, on the Granville Estate, Blackheath, for Mr. Hally. Mr. W. Hill, architect. Quantities supplied:—

Bartlett	£2,692 0 0
Coleman	2,498 0 0
Willmott	2,300 0 0
Harding	2,240 0 0
J. and C. W. Todd	2,239 0 0

For a Wesleyan Chapel, at Bayswater. Mr. W. W. Pocock, architect. Quantities supplied:—

	Chapel.	Extra for Galleries.
Harding, jun.	£4,780	£350
Partridge and Crutch	3,787	362
Smith	3,692	380
Higgs	3,644	345
Greig	3,618	380
J. and C. W. Todd	3,546	342
Adamson and Son	3,497	371
S. S. Wilson	3,349	374
Cowland	3,240	338

TO CORRESPONDENTS.

"*Iron Gates.*"—A correspondent suggests, that drawings or photographs of some of the "ribbon-work" iron gates in Milan would be a great acquisition to the iron trade in England, and that the Society of Arts could get them.

"F. N. L." (thanks). —"W. R. C."—"A. W. M."—"J. T."—"S. H."—"F. W. S."—"E. P."—"A. C."—"T. S." (not yet determined).—"M. R. J." (the cost could not be recovered from the landlord).—"G. D."—"T. H. A."—"W. M."—"J. H."—"C. G." (thanks).—"H. G."

"*Books and Addresses.*"—We are forced to decline pointing out books or finding addresses.

NOTICE.—All communications respecting *advertisements* should be addressed to the "Publisher," and not to the "Editor:" all other communications should be addressed to the EDITOR, and not to the Publisher.